896-4292

June 2, 1998

10095638

Mr. Terry Tanner
U.S. EPA
100 Alabama Street, SW
Atlanta, GA 30303-3104

RE: SCE&G - CPA Site
South Carolina Aquarium Parking Garage Construction
Foundation Pile Placement, Wick Drain Installation, & Pile Driving

Dear Mr. Tanner:

Fluor Daniel GTI, Inc. (Fluor Daniel GTI) on behalf of The Keenan Company, would like to request approval to proceed with the Test Pile Program, Wick Drain Installation, and Pile Driving associated with the construction of the parking garage at the Site. These planned activities will commence after the impacted soil has been removed from the site and prior to placement of the surcharge material. The Test Pile Program will involve the placement of approximately 6 to 8 production precast concrete piles with a length of 100 to 110 feet at various locations under the footprint of the garage structure. The Wick Drain Installation will be done simultaneously with the Test Pile Program. The surcharge material will be placed following completion of Test Pile Program and Wick Drain installation. Each of these issues is discussed below.

Also, your three concerns relative to the parking garage construction activities (i.e., excavated material handling, containment measures, and schedule of field activities, presented in a letter to Walter Irwin, dated October 28, 1997) were addressed in the Removal Action for Soil Work Plan, March 28, 1998. The Health and Safety Plan Amendment was also included in that submittal.

Test Pile Program

The test piles will involve the placement of approximately 6 to 8 production precast concrete piles with a length of approximately 100 to 110 feet at various locations under the footprint of the structure. The process will involve pre-augering the pile location to a depth of 35 feet (the basis for selection of a depth of 35 feet is described below). The pre-augered hole width will be slightly smaller than the smallest pile dimension. This will be done in an effort to start the pile in the proper location and provide the maximum friction around the upper portion of the pile. The piles will be hammer-driven to a depth that is considered sufficient for testing. The piles will be tested during restrikes at two intervals. The first test will occur two to three days after placement and again five to seven days after placement. The piles will be tested by The Pile Driver Testing Analyzer (PDA) which is an instrument that accurately predicts the capacity of a pile from its resistance to driving. The PDA electronically measures (with strain gauges and accelerometers attached to the pile) the predominant unknowns associated with normal driving formulas. From this test, the exact length of

piles to be used for the parking garage can be determined. See Attachment A for additional information. This activity should take between 1 and 2 weeks.

Wick Drain Installation

This activity will be performed simultaneously with the test pile program. The wick installation involves the placement of a two-part prefabricated geocomposite drain consisting of a formed polypropylene core covered with a non-woven polypropylene filter fabric. The fabric allows water to pass into the drain core while restricting the movement of soil particles that might clog the pore. These drains will be placed in a three-foot spaced diamond pattern under the entire footprint of the garage to a depth of 35 feet. The method of placement will be insertion by a hydraulic crowd with the assistance of vibration. The drains, in conjunction with the surcharge will allow acceleration of the typically long settlement time of the upper clay layer. Attachment B provides more information on the wick drains. Installation of the wick drains and placement of the surcharge material should take approximately 4 weeks. The surcharge material will remain in place for a duration of 90 days.

Pile Driving

Pile driving will occur approximately 90 days after placement of the surcharge fill material. Once the fill is removed, piles will be driven in the locations shown on Figure 1, using the same method to drive the piles as presented in the Test Pile Program description.

South Carolina Aquarium Construction Procedures

Construction of the deep foundation system will require the installation of pilings, which are normally driven into the bearing unit after augering (pre-augering) a pilot hole to nearly the total depth of the pile. At the Calhoun Park Area Site, this procedure has raised the potential issue of whether pre-augering and driving piles will allow potential constituents from the shallow saturated upper fill unit to migrate downward into a lower sand aquifer.

Thick deposits of weak, compressible soils underlying the proposed parking garage site and heavy structural loads of the garage will require installation of a deep foundation system bearing in the Cooper Formation (locally known as the Cooper Marl). The Cooper Marl is a thick unit of calcareous sandy silt/silty sand material that is the "basement" strata of the area located approximately 80 feet below ground surface beneath the site. Also, because Charleston is within a known seismically active region, a deep foundation system should provide increased support in the event of an earthquake. Deep foundation design is typical for large structures constructed on the Charleston Peninsula including the South Carolina Aquarium which is currently under construction.

Similar issues relating with the construction of the aquarium directly across from the parking garage location led to the development of a Containment Plan and a Demonstration Program. The documents were prepared by Killam and Associates, Inc. are listed below:

- Containment Plan for the South Carolina Aquarium, Killam, December 1994;
- Guidelines for Demonstration Program, December 1994; and
- Demonstration Program Report, Killam, May 1996 (Attachment C).

The Containment Plan was designed to minimize the release of contaminants from the Aquarium site to the environment during construction. The Demonstration Program was carried out to test the effectiveness of the Containment Plan and the Demonstration Program Report was prepared to document the results of the Demonstration Program.

Three specific goals of the Demonstration Program were to:

1) Determine if pre-augering can be reduced to a depth which does not penetrate the (clay) aquitard between the upper water bearing zone and the lower aquifer (25 - 30 feet below ground surface);

2) If reduced depth pre-augering was possible, assess the effect on the lower aquifer of pile driving alone; and

3) If reduced depth pre-augering was not possible, assess the effectiveness of measures to minimize the potential vertical transport of contaminants between aquifers during pre-augering and pile driving.

The demonstration involved a determination by the City of Charleston's structural engineer as to whether pre-augering could be limited to a shallow depth which would not penetrate the confining layer. It was determined after driving eight initial piles that the depth of pre-augering could be reduced so that the borings would not penetrate the confining layer, thereby minimizing the potential for migration between the upper water bearing zone and the lower sand aquifer. The demonstration also included driving three piles immediately adjacent to a monitoring well screened in the lower sand aquifer. Samples of groundwater were collected from the well before the piles were driven to serve as a baseline. Samples were also collected after the piles were driven to assess whether the lower sand aquifer would be impacted after pile installation. To ensure that groundwater in contact with the piles reached the well, approximately 37,000 gallons of water were pumped from the well prior to sampling. The groundwater analytical data was compared to baseline values and pre-determined water quality data. The samples taken following pile driving indicated lower concentrations of all parameters except for benzene, which remained statistically unchanged.

Parking Garage Construction Procedures

Based on the results of the modified procedures used in construction of the deep foundation for the aquarium, reduced depth pre-augering for pile installation at the parking garage site will be employed. Geotechnical borings were completed at the parking garage site to identify subsurface conditions and pertinent soil characteristics specific to design of the parking garage. The geotechnical borings were completed in August 1997 and oversite of the drilling work was performed by Mr. Charles Till of the U.S. EPA Region IV. An evaluation of the geotechnical results was

conducted by S&ME, Inc. of Charleston South Carolina and the results are presented in a report entitled Geotechnical Exploration Program, (GEP) (Fluor Daniel GTI, October 1997). Objectives of the GEP included:

1) The determination of site subsurface conditions and their relationship to load bearing capacity requirements;

2) Evaluation of site conditions relative to site preparation; and

3) The evaluation of potential foundation design constraints which could potentially effect the construction of the parking garage.

The GEP included drilling six geotechnical exploration borings within the footprint of the proposed parking garage structure. Locations of the borings and the garage structure footprint are illustrated on the attached Figure 1. Due to suspected constituent impacts in the shallow water bearing unit, the borings were advanced using telescoped casing techniques to isolate the shallow and intermediate zones prior to boring advancement. The borings were advanced to total depths of 77 to 97 feet and were terminated within the Cooper Marl. Four intervals of strata of particular importance were identified and confirmed at the boring locations and are listed below:

1) From ground surface, a 6 to 10 feet layer of uncontrolled fill (sand with bricks, concrete, wood, etc.) was encountered. The fill characteristics are consistent with previous investigations conducted in the area of Calhoun Park. At boring location GT-1, there was also subsurface debris present, which prevented drilling;

2) Beneath the fill, a thick (typically 35 feet) very soft, high plasticity clay was encountered. This layer was present at all boring locations and was used to set the upper casings, since this layer is of lower permeability and retards vertical migration of groundwater;

3) Below the upper clay, a sand unit was encountered, generally at a depth of 40 to 45 feet bgs. The unit was present at all deep boring locations; and

4) The final stratum encountered was the Cooper Marl, a soft to hard sandy silt, which was encountered at approximately 80 feet below grade. Borings were advanced into this material at depths ranging from 77 to 97 feet bgs.

Recommendation

Based on the results of the GEP and the Demonstration Program conducted at the South Carolina Aquarium Site, the depth of pre-augering for pile placement at the parking garage site should be limited to approximately 35 feet. By limiting the pre-augering depth to 35 feet to avoid penetrating the upper clay aquitard prior to driving the pilings and keeping the pre-augered hole width slightly smaller than the smallest pile dimension, potential downward migration of constituents via the borehole will be minimized.

If you have any questions or require additional information, please do not hesitate to contact me at 412-823-5300 or Walter Irwin of SCE&G at 803-733-4019.

Sincerely,
Fluor Daniel GTI, Inc.

Andrew Contrael
Project Manager

attachments

cc: Mr. Gregory Tucker (The Keenan Co.)
Ms. Mickey Layden (The Keenan Co.)
Mr. Walter Irwin (SCE&G)
Ms. Julie Puskar (Fluor Daniel GTI)
Mr. Mark Shaheen (Fluor Daniel GTI)

P:\PROJECTS\SCEG\GARAGE\PILINGS.WPD

FIGURES

CONTROL BUILDING

ELECTRICAL SUBSTATION
SOUTH CAROLINA ELECTRIC & GAS COMPANY
TMS No. 459-13-04-002

ARTESIAN WELL

MW-07A

MW-06A

MW-02A

J.J.W. LUDEN'S MARINE SUPPLY

LUDENS PROPERTY

TRANSFORMER HOUSE

CINDER BLOCK WALL WITH WOOD PRIVACY FENCE BEHIND IT (SEPARATE FROM WALL WITH CHAIN LINK FENCE)

CINDER BLOCK WALL WITH CHAIN LINK FENCE

END OF WALL

N75°00'23"E 621.39'

560'X50'

50'X50'

CHAIN LINK FENCE

SPLIT RAIL FENCE

CHAIN LINK FENCE

STUCCO SHELTER COVERING CONCRETE SLAB

EDGE OF GRAVEL

100'X100'

CHAIN LINK FENCE

SPLIT RAIL FENCE

CHAIN LINK FENCE

CHAIN LINK FENCE

WASHINGTON STREET

N14°09'48"W 241.10'

S75°13'12"W 318.79

CALHOUN STREET 70' R/W

CONCORD STREET 50' R/W (SEE NOTE 2)

S63°35'37"W 244.18'

NPS PROPERTY

NPS-GB-04

"SPK" - RAILROAD SPIKE SET IN 33" OAK TREE
ELEVATION = 8.26 NGVD29

THIS DRAWING WAS MADE FROM: FORSBERG ENGINEERING & SURVEYING, INC.
P.O. BOX 30575
CHARLESTON, SOUTH CAROLINA 29417
803/571-2622 FAX 803/571-6780

NO.	DATE	BY	REVISION

INDICATES EXTENT OF EXPLORATORY EXCAVATION. EXCAVATE TO A DEPTH OF 6' BELOW EXISTING GRADE. IF OBSTRUCTIONS ARE ENCOUNTERED, CONTINUE EXCAVATION UNTIL ALL OBSTRUCTIONS ARE REMOVED (APPROX. 1,400 CY OF EXCAVATION)

AREA TO BE EXCAVATED FROM FEASIBILITY STUDY

TREES:
PAL - PALMETTO
SYC - SYCAMORE
MAG - MAGNOLIA
T OAK - TRIPLE OAK
TW OAK - TWIN OAK

NOTES:
1. ALL MONITORING WELLS TO BE PROTECTED DURING CONSTRUCTION ACTIVITIES.
2. ALL EXISTING TREES TO BE PROTECTED DURING CONSTRUCTION ACTIVITIES.
3. THE PERIMETER FENCE MUST BE SECURED PRIOR TO INITIATING EXCAVATION ACTIVITIES.
4. EXCAVATIONS WILL BE COMPLETED TO THE LIMITS AND EXTENTS AS DEPICTED ON THIS DRAWING, OR AS DIRECTED BY THE OWNER'S REPRESENTATIVE.

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

0 30 60
SCALE FEET

FLUOR DANIEL GTI
637 BRADDOCK AVENUE
EAST PITTSBURGH, PA 15112
PHONE: (412) 823-5300 FAX: (412) 824-7215

SOUTH CAROLINA ELECTRIC AND GAS

CHARLESTON, SOUTH CAROLINA

SOIL EXCAVATION LOCATIONS AS PRESENTED IN THE FS.

DESIGNED BY:	DETAILED BY:	CHECKED BY:
R.C.	C.M.B.	R.C.

DRAWING DATE:	ACAD FILE:
2/19/98	98079111.DWG
PROJECT NO.: 01003-0791	CONTRACT:
DRAWING: 1	REVISION:

ATTACHMENT A

EXHIBIT A

S&ME

Dynamic Pile Testing

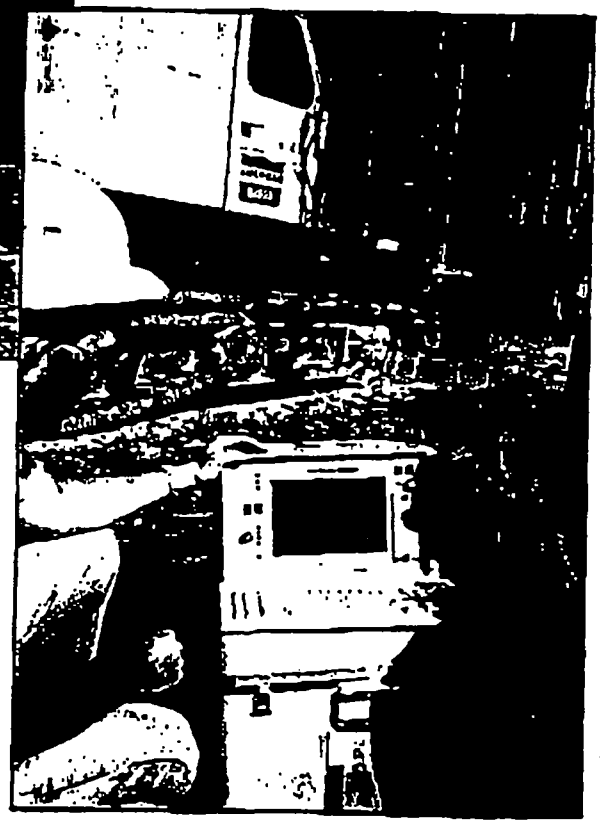
Whether for elevated protection against warring neighbors and marauding animals, or as a means of supporting structures in soft soil or marine environments, driven piling has been one of man's earliest foundation methods. Although it dates back to prehistoric lake villages, until the late nineteenth century, the design of pile foundations was based entirely on experience, or even divine providence. Since then, theoretical approaches to the dynamic assessment of pile capacity have come in the form of numerous pile driving formulas, all of which relate ultimate load capacity to vertical pile movement per blow of the driving hammer.

However, due to the inherent difficulties in establishing the input parameters (hammer efficiency, inertial forces in the soil, energy losses), such driving formulas may yield conservative results, (Factors of Safety of 6 to 12). The traditional alternatives have consisted of performing time consuming and expensive static load tests, or typically accepting an "unknown" and potentially costly overdesign of pile foundations.

The Pile Driving Analyzer™ (PDA) is an instrument that accurately predicts the capacity of a pile from its resistance to driving. During initial driving, or a subsequent "restrike", the PDA electronically measures (with strain gauges and accelerometers attached to the pile) the predominate unknowns associated with normal driving formulas, and then internally generates "on-the-spot" results. Due to this unique ability, as evidenced time and again through comparisons with direct static load tests, the PDA has become widely accepted as state-of-the-art in the geotechnical engineering community.

The major advantage of the PDA is its simplicity. Expensive static pile load tests typically require driving or drilling of reaction piles, setting up heavy reaction frames and complicated instrumentation, and round-the-clock monitoring for typically 6 to 72 hours. A typical PDA test for capacity takes less than 30 minutes. This speed, and corresponding cost effectiveness, makes PDA testing particularly well-suited for production pile "proof" testing. By testing numerous production piles on large foundation projects, problems of inadequate capacity or wasteful overdesign can be identified and eliminated.

The PDA system consists of gauges bolted to the pile top (above) which are connected to a compact analyzer (below).



Typical static load test requirements: crane, reaction system, jack, pile hammer, reference beams (above)

and equipment needed for dynamic testing: crane, pile hammer, and PDA (right).

Although its ability to accurately determine pile capacity is generally its most used attribute, the PDA can do much more. The PDA simultaneously calculates pile capacity, pile stresses, pile integrity, transferred hammer energy, and other dynamic parameters. In difficult driving the PDA can be used to monitor stresses to prevent pile damage or as a means to determine the least stressful driving system.

Dynamic pile testing is the state-of-the-art in foundation engineering. The Federal Highway Administration, which funded much of the research, recommends the PDA be used on all applicable FHWA jobs. Many state highway departments (Florida and North Carolina for example) routinely use dynamic testing on their projects. The offshore oil industry has relied on dynamic testing for years. A recent survey estimates that the PDA is used on over 1500 projects each year. The technology is proven and widely accepted. We invite you to explore through us the benefits of using the Pile Driving Analyzer™ on your driven pile foundation projects.

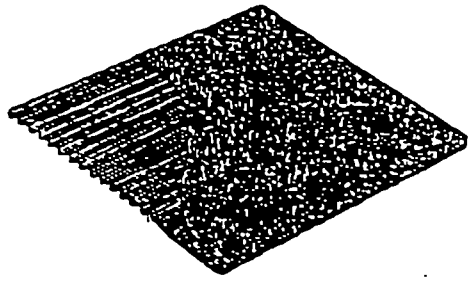
For additional information or testing, contact Billy Camp or Forrest Foshee
(803) 884-0005
840 Low Country Blvd.
Mount Pleasant, SC 29464

ATTACHMENT B

EXHIBIT B

AMERDRAIN® 407 soil drainage wick

AMERDRAIN 407 is a two-part prefabricated geocomposite drain consisting of a formed polypropylene core covered with a non-woven polypropylene filter fabric. The fabric allows water to pass into the drain core while restricting the movement of soil particles which might clog the core.

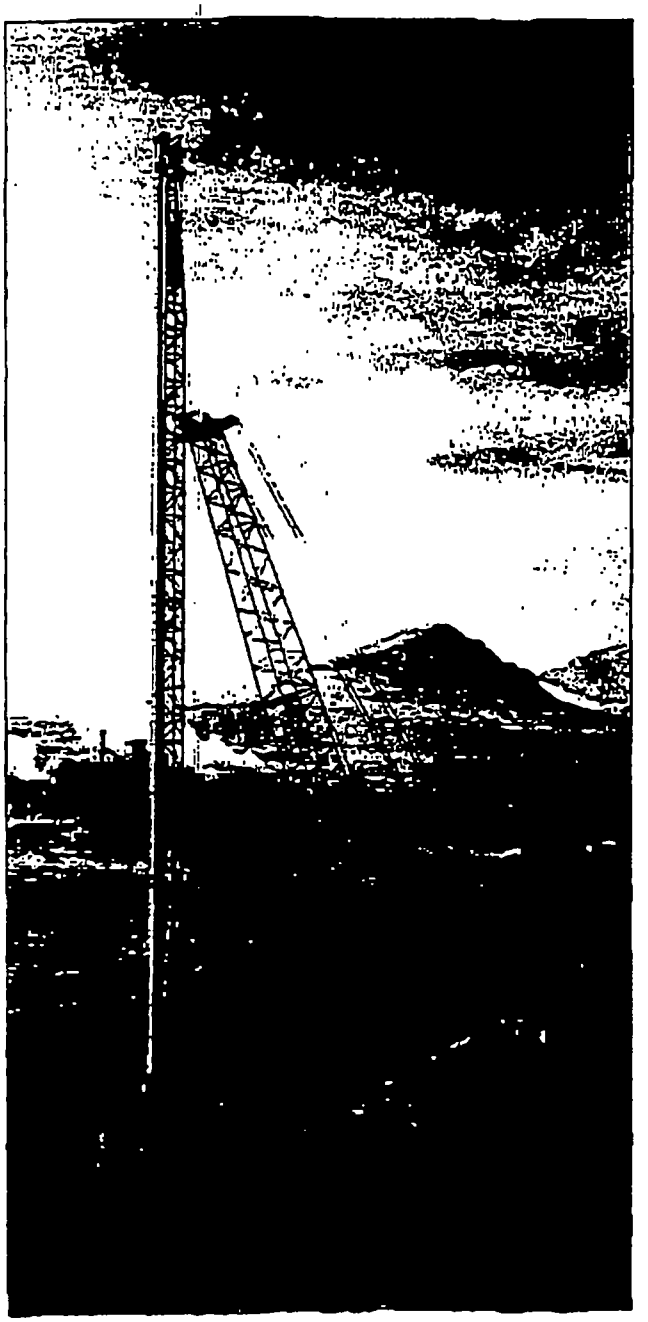


Typical Properties	AMERDRAIN 407	Test method
Fabric properties		
Material	Polypropylene	
Weight, gm/m^2	136	ASTM D3776
Grab tensile strength, kN	0.64	ASTM D4632
Trapezoidal tear, kN	0.33	ASTM D4533
Mullen burst strength, kN/m^2	1,207	ASTM D3786
Puncture strength, kN	0.22	ASTM D4833
Elongation at break, %	>70	ASTM D4632
Permeability, cm/sec	0.03	ASTM D4491
Flux, lpm/m^2	2,525	ASTM D4491
A.O.S., mm	0.17	ASTM D4751
Core properties		
Material	Polypropylene	
Tensile strength, kN	1.78	ASTM D1621
Drain properties		
Discharge capacity, m^3/sec	100×10^{-6}	ASTM D4716
Weight, gm/m	80	
Width, mm	100	
Thickness, mm	3	
Roll length, m	305	
Roll weight, kg	24.5	

AWD AMERICAN WICK DRAIN CORPORATION
316 Warehouse Drive Matthews, NC 28105, USA
Phones 800 242-WICK & 704 821-9300 FAX 704 821-6448
Telex 572385

AMERDRAIN®

Prefabricated vertical soil drain



Salt Lake City, Utah

A soil drainage method for accelerating settlement through vertical drainage

High flow vertical drainage

AWD AMERICAN WICK DRAIN CORPORATION

Introduction

The problem

Historically, the design of structures on soft compressible soils (clays) has created problems for civil engineers. Construction without some sort of soil treatment is usually impractical due to unpredictable long-term settlement. Simple surcharging as a soil consolidation method can take many years. Although surcharging increases water pore pressure, settlement can take considerable time, as the water lacks easy path to leave the soil.

The solution

Soil consolidation using prefabricated vertical drains (also commonly called wick drains or band drains) can reduce settlement times from years to months. Most settlement can occur during construction, thus keeping post-construction settlements to a minimum.

Consolidation of water-saturated, fine-grained soil occurs very slowly because of the low permeability of these soils impedes the escape of pore water from the soil voids. Even under large temporary surcharge loads, settlements can take years because of this slow water movement and the great distance the water must move to exit the soil. The installation of prefabricated vertical drains greatly reduces the distance the water must move to reach a free drainage path, and therefore greatly increases settlement rate (Figure 1). Drain spacing may be adjusted to match the required settlement time.

AMERDRAIN prefabricated drains (Figure 2) are installed vertically to depths as great as 50 meters (164 feet). The water, under pressure in excess of hydrostatic, flows through the filter and into the channels where it is led vertically out of the soil. This may be either up or down to intersecting natural sand layers or to the surface where a sand drainage blanket or prefabricated strip drains are provided. The water in the soil only has to travel the distance to the nearest drain to reach a free drainage path. The drains are usually placed in a triangular configuration of 1 to 10 meters (3 to 33 feet) - depending on the desired consolidation time. As a result of this method of accelerating the consolidation process, uneven post-construction settlements can be virtually eliminated.

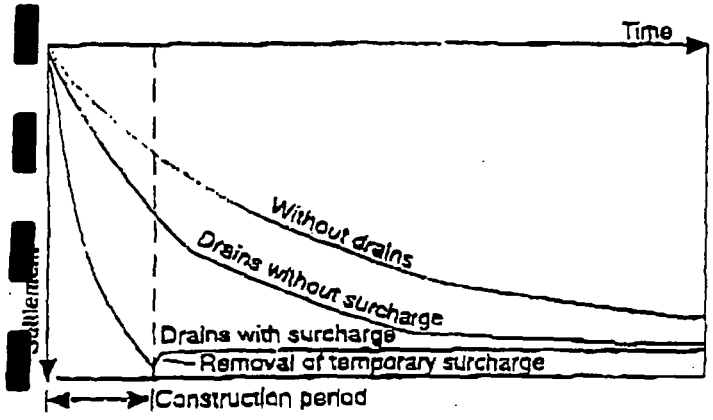


Figure 1

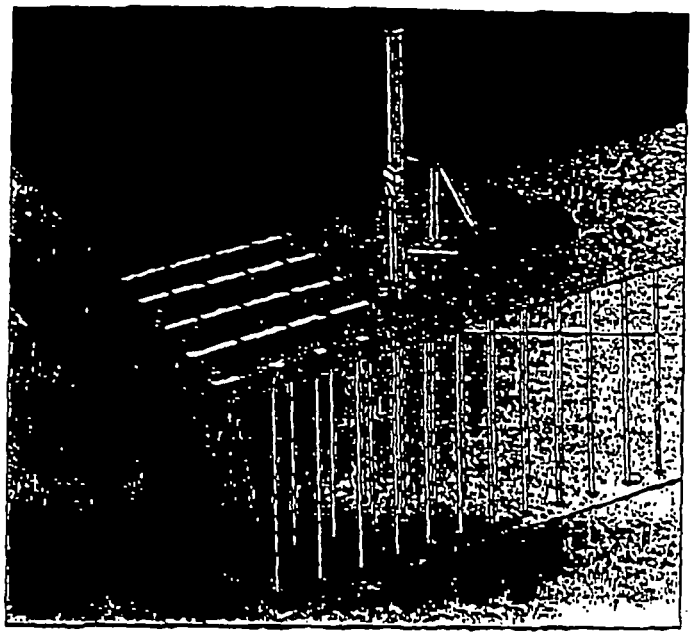


Figure 2 - Typical vertical drain installation

Figure 3 - AMERDRAIN Prefabricated vertical soil drain

ATTACHMENT C

Killam
Associates ▫ Consulting Engineers

South Carolina Aquarium
Charleston, South Carolina

Demonstration Program Report

May 1996

Table of Contents

LIST OF TABLES

Table of Contents
(continued)

LIST OF APPENDICES

LIST OF FIGURES

EXECUTIVE SUMMARY

The City of Charleston has proposed to construct the South Carolina Aquarium in a waterfront area known to contain environmental contaminants. In order to construct the Aquarium while minimizing any off-site migration of these contaminants, the City developed a plan for a containment system, which was approved by the applicable regulatory and trust agencies and by the National Park Service, the owner of the site. This report documents the results of implementing the program specified by the "Guidelines for Demonstration Program," December, 1994. The program was intended to demonstrate the efficacy of the containment system in preventing the migration of contamination to surface water and/or groundwater as a result of Aquarium construction. In addition, the Demonstration was intended to determine the minimum required depth of preaugering.

Prior to commencing with the Demonstration, two monitoring wells were installed (in addition to a pre-existing one), baseline water quality samples were taken in the Cooper River and in the sand aquifer, and the containment system was installed. The latter included a silt curtain surrounding the subtidal portion of the site, a three-foot thick sand blanket placed over the subtidal sediments, a timber lagging wall separating the subtidal area from the intertidal area, sand fill upland of the wall creating a final elevation above high tide, and site drainage controls. A portion of the sand fill on the landside of the timber lagging wall, not required for the Demonstration, will be completed before construction of the Aquarium continues.

The baseline water quality samples were intended to document water quality conditions in the Cooper River and sand aquifer to provide a benchmark against which any impacts of the demonstrated pile driving could be measured. A total of six rounds of samples were taken in the river, at " adjacent" sampling stations which could be impacted by pile driving (immediately outside of the containment), as well as potentially unaffected "background" stations. A total of three rounds of samples were taken from the three monitoring wells.

The Subtidal Demonstration

A total of eleven subtidal piles were driven in the Demonstration. This process was closely observed to determine if any visual indications of sediment release were present. The blanket at the point of pile insertion was covered by water for some pile driving events and "dry" for others, depending on the stage of the tide. The effect of the pile driving on the sand blanket could be readily observed under "dry" conditions. No visual indications of sediment release or breakthrough were noted.

During and after the time that piles were being inserted into the sand blanket and driven, water quality samples were taken at the seven sampling stations for which baseline data had already been generated. A total of seven rounds of samples were taken to measure any

potential impacts of this operation. In addition, one sample was taken within the containment during pile driving.

Data from these seven sampling rounds were compared with pre-determined water quality criteria and with the baseline data (through the use of a statistical measure called the 95% upper confidence limit or "UCL," which characterizes inherent variations in the data). All of the Demonstration program results were lower than the criteria and/or the 95% upper confidence limits. On this basis, the pile driving was determined to have no discernible effect on surface water quality in the Cooper River.

In addition, core samples were taken from the sand blanket to determine if pile driving caused a significant migration of sediments upward through the sand blanket. Observations of these cores determined that no significant upward migration occurred. Thus, the sand blanket, from a visual perspective, appeared to be completely effective in containing underlying sediments.

The Upland Demonstration

The upland Demonstration involved a determination by the City's structural engineer as to whether preaugering could be limited to a shallow depth which would penetrate only a contaminated surficial aquifer, and not a confining layer above the lower sand aquifer. It was determined after driving eight initial piles that preaugering could indeed be restricted to a depth which would not penetrate this layer, and therefore not open up a migration pathway between the surficial and lower sand aquifer.

The upland Demonstration then included driving three piles immediately adjacent (within six to eight feet) of a monitoring well screened in the sand aquifer. Approximately 37,000 gallons of water were pumped from the well so that water in contact with the piles would be drawn to the well. The well was sampled, and the resulting data compared to baseline values and to pre-determined water quality criteria. The samples taken following pile driving indicated lower concentrations of all parameters except for one, benzene, which remained statistically unchanged.

Conclusion

The results of the Demonstration were compared to evaluation criteria set forth in the Guidelines for Demonstration Program, December, 1994. In Killam's opinion, these results meet all criteria for success. Killam recommends that the City of Charleston forward this report to the National Park Service and request their concurrence on this finding.

REPORT UPON DEMONSTRATION PROGRAM
SOUTH CAROLINA AQUARIUM PROJECT

1.0 Introduction

This report documents the results of the Demonstration Program which was carried out to test the effectiveness of a containment plan developed for the South Carolina Aquarium project. The containment plan was designed to minimize the release of contaminants from the Aquarium site to the environment during the construction of the project. The specific goals of the Demonstration Program are:

- Provide a field demonstration of the components of the containment plan and of the augering process. (Augering immediately precedes the installation of each upland foundation pile for the Aquarium building.)
- Provide information demonstrating the efficacy of the proposed containment system to be used during construction.
- Subtidal: Demonstrate, by visual, physical and chemical data, that the sand blanket will contain underlying contaminants (including contaminated sediments) during pile placement and driving.
- Upland: First, determine if pre-augering in the upland and intertidal areas can be reduced to a depth which does not penetrate the aquitard between the upper and lower aquifers. If this is possible, the upland demonstration will permit the assessment of the effect on the lower (sand) aquifer of pile driving alone. If this is not possible, the upland demonstration will permit assessment of the effectiveness of measures to minimize the potential vertical transport of contaminants between aquifers during preaugering and pile driving.

Three underlying documents should be referred to for a complete description of the proposed containment systems, the monitoring methods proposed for the Demonstration Program as well as construction, and the protocols to be followed in conducting and judging the success (or failure) of the Demonstration Program. These documents are:

1. Containment Plan for the South Carolina Aquarium, Killam, December 1994.
2. Environmental Monitoring and Response Plan, Killam, December 1994.
3. Guidelines for Demonstration Program, December, 1994.

2.0 Subtidal Demonstration

The subtidal demonstration program required driving a total of eleven piles in two clusters to determine if this operation would impact the Cooper River. The primary containment mechanisms used to prevent such an impact include a sand blanket and a silt curtain. During the Demonstration, the performance of the containment systems was to be judged by visual means, by monitoring turbidity, by monitoring the chemical quality of the surface water, and by taking core samples of the sand blanket.

2.1 Demonstration Program Procedures and Preparation

Baseline Sampling

A total of six rounds of baseline water quality samples were taken in order to establish water quality concentrations prior to pile driving. Three of these sampling rounds were taken prior to the installation of the containment system, with three rounds taken following the installation of the containment system. In accordance with the Guidelines for Demonstration Programs, the baseline data set also includes data from several prior investigations. These include the Preliminary Site Characterization Summary - CPA Site, Chester Environmental, April, 1994; Site Inspection - Charleston Harbor Site, PSI, June, 1994; and Site Investigation Results and Responses to Agency Comments - SCA Site, Killam, December, 1994.

As described in the Environmental Monitoring and Response Plan, (Killam, 1994), seven monitoring stations were established, including three adjacent stations (ADJ-1, ADJ-2, and ADJ-3) and four background stations (BG-1,BG-2,BG-3, and BG-4). Figure 1 illustrates the location of each of these stations. Tables 1 through 6 present a summary of the results of the baseline sampling for the adjacent stations and background stations.

Baseline turbidity monitoring was conducted from October 3, 1995 to October 17, 1995. This included daily sampling at each monitoring station for a total of 15 days. For three days, hourly turbidity measurements were taken over a complete tidal cycle (12 hours). The turbidity data is summarized in Table 7.

Calculation of 95% Upper Confidence Limits

For the chemical water quality data, 95% upper confidence limits (UCLs) were calculated for each parameter. In calculating these limits, data from adjacent stations, background stations, and prior studies were aggregated. Please note that data from samples taken in the vicinity of the site during prior studies were included in the baseline data set, consistent with the Guidelines document. The calculated UCLs are presented in Table 8. Table 9 is a summary of the data used to calculate the 95% confidence limits, including the data from prior studies.

The previous data are identified on Table 9 by study author (PSI, Chester, Killam) and by original sampling station number.

The design of the Demonstration Program uses the 95% UCL to compare data generated during the Demonstration to the baseline data set. The 95% UCL is an accepted measure used to characterize a population of data points. Further, it is relevant to the data evaluation process in that it reflects the expected variation in data points around the mean. For the current application, a two-tailed normal distribution of data points was assumed. However, the actual data generated in the baseline and demonstration data sets were predominated by values which were below the laboratory's analytical method detection limit (MDL). In order to permit a calculation of the 95% UCL, a positive numerical value was required to be assigned to each of these non-detects. Although the actual value could be anywhere between zero (at a minimum) and the detection limit (at a maximum), an arbitrary value of 50% of the detection limit was used. This procedure is consistent with the Guidelines document and is a commonly accepted practice.

Since the calculated 95% UCLs for many parameters were derived solely from non-detect data with values primarily set at 50% of the detection limit, it was decided that these UCLs should not be used for data evaluation. In these cases, the data from the Demonstration are compared to the criteria values alone. For other parameters, the data values used to calculate the UCLs were dominated by non-detected values, but not solely derived from them. This is noted on the applicable tables as a ratio of detected values to total data points (detected and non-detected). It should be noted that the fewer positive values which are present in the data set, the less meaningful is the UCL as a descriptor of the sample population. Therefore, as an alternative to the UCL, the maximum detected baseline concentration was used in a number of cases to compare the baseline data set to the demonstration data.

It should be noted that the inclusion of data from prior studies in the baseline data set, in accordance with the Guidelines document, significantly affected the calculated 95% UCL for certain metals, i.e., copper and lead.

Installation of Containment Systems

Following the first three rounds of baseline monitoring, the subtidal containment systems, including the sand blanket, timber lagging wall, and silt curtain, were installed at the site. Portions of the landside sand blanket have not yet been installed. This will be completed prior to re-commencing with construction in this area.

Unanticipated difficulties were encountered in the installation of certain portions of the containment. These were attributed to soft sediments which occur to a considerable depth in the northern portion of the subtidal zone. As a result, longer than expected H-piles were

required for completion of the timber lagging wall, and a waler system was installed to further stabilize the wall. The completion of the landside sand blanket and waterside wedge in the area of the "island" (a riverward peninsula formed by the lagging wall) will require the use of a modified design, including geofoam and a geotextile grid. It is fully anticipated that the remaining portions of the sand blanket can be installed with these modifications, after the revised design is approved by the National Park Service and OCRM/DHEC.

The soft sediment conditions in the northern portion of the site resulted in some settling of the sand blanket and wedge into the underlying sediments, particularly along the boundary of the site. This was particularly evident in those areas where sand was placed with methods which caused a relatively concentrated local loading on the sediments. Settlement along these edges caused some local lateral displacement of sediments, which were observed to form a "wave" or mound at the toe of the sand wedge. Over a period of weeks, this mound was observed to flatten, stabilize and settle into a smooth contour.

Installation of the waterside sand blanket was accomplished using a baffled hopper which distributed the sand in uniform thin lifts. Placing the blanket in this fashion caused a gradually increasing and uniform load on the sediments, resulting in some consolidation of the underlying sediments. The installation was successful: cores taken through the blanket reflected a clean separation between the underlying sediments and the sand. The cores also documented the fact that the blanket was at least three feet in thickness across the site, consistent with requirements of the project specifications.

The installation of the containment system was initiated in December, 1995 and was completed in February, 1996 (with the exception of the sand blanket/wedge in the "island" area, as noted above).

2.2 Driving the Demonstration Piles

The first subtidal demonstration pile was driven on March 28, 1996. The final subtidal demonstration pile was driven on April 4, 1996.

The piles were delivered to the site by barge during the "top" of the tidal cycle, to avoid grounding the barge on the sediments adjacent to the site and causing sediment disturbance.

The Contractor constructed a two-level template to guide the piles to their intended location. This template was constructed of H-piles, with the upper level approximately 12 feet above the lower level. This steel structure was allowed to rest on the sand blanket, which caused no significant disturbances. Piles were lifted by crane and inserted into the template. The piles were observed to settle under their own weight to a depth of approximately 45 feet below the sand surface. In one case, the pile was initially prevented from reaching this depth

by some debris. When this occurred, the crane operator lifted the pile (several times) not more than 2 to 3 feet, then allowed the weight and momentum of the pile to permit its settlement to the approximately 45 foot depth. No sediments were observed to penetrate the sand blanket, or to be carried on the pile back through the sand blanket when this occurred.

It should be noted that a number of the demonstration piles were driven when the tide was low and the penetration point of the pile was well above the concurrent waterline. This permitted clear observation of the impact of pile insertion and driving on the sand blanket.

After all of the piles in each cluster had been inserted into the template, a hammer was mounted on the crane and used to drive the piles to the final elevation specified in the design documents.

2.3 Demonstration Monitoring

During pile insertion and driving, a shallow conical depression was observed to form about the base of the pile. This depression was less than 12 inches in depth and 24 inches in radius. It is believed that sand and/or sediment immediately surrounding the pile was dragged down along the pile surface, or was caused to settle by the pile. These depressions were not sufficient to affect the integrity of the sand blanket, and were filled in with sand by wave/water action during the next tidal cycle. Shallow hand probing with a plastic pipe immediately adjacent to the driven piles failed to detect any evidence of sediment within the sand.

When the insertion point of the pile was in water only several inches deep, pile insertion and driving did not cause sufficient turbidity to impact the water's visibility.

On a visual basis, the sand blanket appeared to be completely effective in containing the underlying sediments. No visible discharges were noted, even in those cases where the insertion point could be clearly observed.

During pile insertion and driving, five rounds of water samples were taken from the monitoring stations to assess the impact of the pile installation procedures on water quality in the river. One round of samples was taken immediately following the installation of each pile cluster. In addition, a single water quality sample was taken within the silt curtain during pile driving to assess water quality impacts in an area closer to the pile than the adjacent stations. Tables 10 through 16 contain a summary of the water quality data generated in each of seven sampling episodes associated with the subtidal pile driving. These events are identified by letter, A through G. A summary of the data generated from the water sample taken inside the silt curtain during pile driving is contained in Table 17. The data above are discussed in Section 2.4. A description of contractor activities, tidal movements in the river,

and other pertinent observations during the sampling events is included in Appendix A. This information was prepared by S&ME, the City's Environmental Inspector.

2.4 Evaluation of Demonstration Monitoring Data

The Demonstration Monitoring Data presented in Tables 10 through 17 were compared with the 95% UCLs which are presented in Table 8, and with the water quality criteria values specified in the Demonstration Guidelines document. For convenience, the criteria values have also been included in Table 8 as well as in Tables 10 through 17.

In evaluating the data, the Guidelines document specifies a protocol in order to determine if the pile driving activities have had a significant impact on the environment. This protocol requires a comparison of the data from the adjacent sampling stations (which are presumed to be potentially impacted by the pile driving) with the data from the background stations (particularly those stations which are "up-tide" or upstream from the site at the time the samples are taken, and therefore assumed to be unaffected by site activities). The protocol also requires a comparison of the adjacent data with the criteria values, and the 95% UCLs calculated from the baseline data set.

In conducting this evaluation, comparisons were first made against the criteria and 95% UCL values. Any "Adjacent" station data points exceeding the higher of these values would then be compared to the concurrent upgradient background values. Salient points from the notes in Appendix A are included in the discussion below. In addition, turbidity data taken during the sampling episodes is included in Appendix B.

"A" Sampling Round, March 28, 1996

At the time of the first sampling round, the Contractor was setting four piles at cluster C-4. All four piles were set with the insertion point above water level (in the dry). The tide was low and incoming. Heavy rains the previous night caused substantial discharge outside the containment area at the adjacent storm sewer outfall. The discharge was blackish in color and visibly impacted locations ADJ-3, and BG-3. An oily sheen was visible outside the containment prior to any on-site activities, presumably from the storm water discharge or other off-site events.

The results of this sampling round indicated that ADJ-3 exhibited a copper concentration of 4.5 ppb and BG-3 exhibited an even higher copper concentration of 6.0 ppb. These exceeded the criterion level for copper of 2.9 ppb. However, both of these results were within the 95% UCL value of 9.65 ppb. The 95% UCL for copper was calculated from a data set in which copper was detected in four samples out of a total of 39, or 10% of the time. The

maximum concentration of copper detected in the baseline data set was 76.3 ppb. No other parameters in the "A" sampling round exceeded criteria levels.

The results of the "A" sampling round meet the criteria for success as specified in the Demonstration protocol; the presence in copper in the samples was likely caused by factors external to the site (i.e., the stormwater discharge), rather than by the pile insertion.

"B" Sampling Round, March 28, 1996

At the time of this sampling round, the Contractor was setting the last of the four piles in cluster C-4, and was disassembling part of the template (to permit driving). The insertion point of the pile was underwater. The tide was high and incoming. The blackish discharge from the storm drain was continuing and was reaching ADJ-3 and BG-3.

The results of this sampling round indicated that no parameters exceeded the specified criteria values.

"C" Sampling Round, March 28, 1996

At the time of this sampling round, the piles in cluster C-4 were being driven. The insertion point was underwater. The tide was high and outgoing.

The results of this sampling round indicated that, while copper was undetected at ADJ-3, a duplicate sample exhibited a copper concentration of 3.7 ppb. The criterion for copper is 2.9 ppb. The 95% UCL for copper is 9.65 ppb. No other parameters in the "C" sampling round exceeded criteria levels. Therefore, these results are acceptable as judged by the Guidelines protocol.

"D" Sampling Round, March 29, 1996

The Contractor was driving piles in the C-4 cluster during this sampling round. The insertion point was underwater. The tide was high and outgoing.

The results of this sampling round indicated that, while lead was undetected at ADJ-3, a duplicate sample exhibited a lead concentration of 6.8 ppb against a criterion of 5.6 ppb. The 95% UCL for lead is 10.72 ppb, and was calculated from a data set in which lead was positively detected in three samples out of 39, or 8% of the time. The highest concentration of lead in the baseline data set was 81.1 ppb. No other parameters in the "D" sampling round exceeded criteria levels. Therefore, these results pass the Guidelines protocol.

"E" Sampling Round, March 29, 1996

This sample was taken shortly following the completion of pile driving at cluster C-4. An oily sheen was noted outside of the silt curtain, presumably from off-site sources. Black water from the storm drain visually appeared to be affecting station ADJ-3 as evidenced by leaves and dark sediment on the outside of the silt curtain. The tide was low and incoming.

Only one sample taken in this round (ADJ-3) exceeded criteria levels. This sample exhibited a lead concentration of 6.8 ppb as compared to a criterion of 5.6 ppb. Since the 95% UCL is 10.72 ppb, and no other parameters exceed criterial levels, these results pass the requirements of the Guidelines document protocol.

"F" Sampling Round, April 3, 1996

During this sampling round, the Contractor was driving a pile in Cluster C-2/3. The pile insertion point was above concurrent waterline (dry). High turbidity was noted at ADJ-3 (105.7 NTU) and ADJ-2 (19.8 NTU). This appeared to be caused by waves breaking on soft sediments to the south side of the site during low tide and not by the pile driving operation. Turbidity in the water was noted prior to the initiation of pile driving activities. The tide was low and incoming.

One sample in this round (ADJ-3) exhibited values above criteria levels. This included copper at 3.3 ppb (compared to the 2.9 ppb criterion) and nickel at 9.7 ppb (compared to a criterion of 8.3 ppb). Both values are within the 95% UCL values (9.65 ppb for copper and 9.72 ppb for nickel). The 95% UCL for nickel is based on 25 positive detects, of which the highest value is 10.7 ppb. No other parameters in the "F" sampling round exceeded the criteria levels. Therefore, these results pass the requirements of the Guidelines protocol.

"G" Sampling Round, April 4, 1996

This sampling round occurred shortly following the completion of pile driving in the C-2/3 cluster. The tide was low/incoming and the water was turbid from wave action on the south side of the site.

One sample in this round exhibited a value above criteria levels. This was a sample from ADJ-2 which exhibited a copper concentration of 4.1 ppb, as compared to the 2.9 ppb criterion. The observed value is within the 95% UCL of 9.65 ppb. No other parameters in the "G" sampling round exceeded criteria levels. Therefore, these results pass the requirements of the Guidelines document protocol.

Inside-Silt Curtain Sample

Although not subject to a success/failure determination in the Guidelines document protocol, a sample was taken from within the silt curtain during the driving of a pile in cluster C-2/3. The tide was medium and outgoing. The insertion point was above concurrent water level (dry). All values obtained from this sample are within the criteria levels.

Sand Coring

The Environmental Monitoring and Response Plan requires taking three sand cores within three feet of the demonstration pile cluster following pile driving. This is intended to assess the potential migration of sediment into the sand blanket. Since the Demonstration consisted of two pile clusters (five piles at C-4 and six piles at C-2/3), sand cores were taken at both clusters. In addition, cores were taken near cluster C-2/3 prior to pile driving to document both pre-driving and post-driving conditions. Sand core reports by S&ME are included in Appendix C.

To summarize, the three sand cores taken following driving of piles at cluster C-4 indicated that silt migration into the sand blanket ranged from two to four inches, with a blanket thickness of 43 to 46.5 inches. This is a minimal amount since some migration may have occurred during sand blanket installation. This is far less than the tolerance specified in the Environmental Monitoring and Response Plan, which allows up to two-thirds of the sand blanket thickness. (At this location the maximum amount of penetration allowable would range from 29 to 31 inches.)

Prior to driving the piles at C-2/3, two cores were collected in the area. The thickness of the sand blanket ranged from 43.5 to 49.5 inches. Examination of the core indicated a zone of silt migration approximately two inches in length.

Following the driving of piles at C-2/3, three cores were collected. The thickness of the cores ranged from 46 to 51 inches. The extent of silt migration into the blanket ranged from two to six inches. This is considered to be minimal, and far less than the tolerance specified in the Environmental Monitoring and Response Plan, which allows between 30 and 34 inches in this area.

Overall, the results from the sand coring indicate that pile driving has not significantly affected the integrity of the sand blanket to any significant degree.

Summary

It is apparent that water quality at the Aquarium site is significantly influenced by area-wide factors, including wind/waves (acting on sediments in shallow water), stormwater discharges from outside the containment area, ship traffic (including tug-assisted ship turning), and other off-site activities. It is also clear that the water quality in the adjacent Cooper River is better than might have been expected, and shows little impact from the contaminated sediments which exist in the general area. While a limited number of exceedences of the surface water quality criteria for a total of three metals (copper, lead, and nickel) were noted in both the baseline and Demonstration data sets, they were all minor and of apparently short duration.

It may be observed that a disproportionate number of the criteria exceedences occurred at ADJ-3 in the Demonstration data as well as the baseline data set. This location appears to be impacted by one or more factors, including proximity to the storm drain, proximity to offsite activities occurring to the south, and the impact of local current patterns in the vicinity of the station.

Applying the protocol specified in the Guidelines document, it is therefore concluded that pile driving does not have a significant impact on water quality in the Cooper River. This conclusion is reinforced by visual observations of the pile driving activities, in which the effectiveness of the sand blanket in preventing the migration of potentially contaminated sediment was clearly observed.

3.0 Upland Demonstration

The upland demonstration program was designed to determine:

1. If preaugering could be limited to the vertical extent of the fill zone and silty confining layers, which are present within 25 to 30 feet of the ground surface;

2. If preaugering and pile driving would impact the quality of the lower sand aquifer.

In order for the structural engineer to make the first determination, the demonstration included up to ten piles at locations selected by the engineer. Following this initial phase of the Demonstration, three piles were to be driven near the location of MW-AQ2 using either full-depth preaugering or reduced-depth preaugering (as determined in the initial phase of the Demonstration). MW-AQ2 would then be pumped in a sufficient volume to permit groundwater in contact with these adjacent piles to reach the well. Finally, the well would be sampled and the resulting data compared to groundwater criteria values contained in the Guidelines document.

3.1 Demonstration Program Procedures and Preparation

The upland Demonstration Program required the installation of Monitoring Well MW-AQ2. This well was installed, along with MW-AQ3, in February, 1996, although the latter well was not intended for use in the Demonstration. MW-1, installed during the prior investigation (Killam, 1994), completes the three well array which will be monitored during Aquarium construction. A well log for MW-AQ2 is included in Appendix D. An examination of the soil boring reveals that the soil conditions at this location differ from the "average" site condition, which includes an upper water bearing zone, a silty "aquitard," and a lower sand aquifer. At MW-AQ2, the intermediate confining layer is missing, a condition which occurred in a number of the site borings documented in the 1994 Killam investigation. Apparently, the intermediate confining layer is discontinuous over the site. This finding contradicts the original conceptual model for the site which assumed two distinct aquifers. If a continuous water-bearing zone is present, concern over transport of contamination between aquifers is greatly reduced.

All three monitoring wells were sampled on three occasions prior to preaugering, on February 20, February 21, and February 26, 1996. Concerns over the formation of air bubbles in the samples taken for volatiles analysis (attributed to a reaction of the mineral content of the groundwater with acid preservative in the sample vials) lead to three additional sampling rounds which occurred on February 27 and 28. In the latter sampling rounds, water was only sampled for volatiles analysis. The data generated from the sampling rounds described above constitutes the baseline data set, from which 95% UCLs were calculated for MW-AQ2. Table 18 contains the calculated 95% UCL values plus the data points used in their calculation. Summaries of the baseline data set for all three monitoring wells is included in Appendix E. In Table 18, the values for benzene were derived from the February 27/28 sampling round, since no air bubbles were found to occur (no preservative was used). In fact, the original data showed higher benzene concentrations, indicating that no significant loss of benzene had occurred as a result of gas evolution in the samples.

The results of the baseline samples were significant in that samples from MW-AQ2 (and MW-AQ3) exhibited much higher levels of contamination than did the samples from MW-1. The latter well was the only deep well sampled during the previous site investigation. Since the data from this well (generated during the site investigation) indicated that ground water was relatively clean, and most of the borings reflected the presence of a two-aquifer system, concerns over potential contamination of the lower aquifer were raised and addressed in the Containment plan and Demonstration plan. With MW-AQ2 exhibiting significant levels of contamination, and with no confining layer observed at MW-AQ2, concerns over pile driving causing contaminants to impact an uncontaminated, confined aquifer are considerably lessened if not eliminated. In short, the lower (sand) aquifer in the areas of MW-AQ2 and MW-AQ3 is already contaminated, either from upgradient sources or overlying sources, or both.

Nonetheless, it remains necessary to take reasonable precautions to avoid any potential increase in the rate of migration of contaminants to the lower aquifer. These precautions are included in the current plans for construction.

3.2 Driving the Demonstration Piles

The first demonstration pile was preaugered on March 5, using reduced-depth preaugering, and was driven on March 6. A total of eight piles were driven prior to driving the three-pile cluster at MW-AQ2. From the installation of these initial piles, which were instrumented with a PDA (Pile Driver Analyzer), the structural engineer determined that reduced-depth preaugering was feasible. It was also observed that the volume of drill cuttings produced by the preaugering process was much less than anticipated. This is due to the use of a auger head on a narrow shaft, as opposed to a continuous flight auger. Environmentally, the use of an auger head (with reduced drill cutting generation) is preferable since fewer voids would tend to be created in the borehole. Visual observations of the preaugering process indicated that the borehole immediately closes upon the extraction of the auger head. Since this observation was made consistently, it is felt that earlier concerns over an open borehole acting as a vertical conduit are considerably lessened.

Since the structural engineer determined that reduced depth preaugering was feasible, the three pile cluster at MW-AQ2 was installed with this method. All remaining upland piles will also be installed using reduced-depth preaugering.

3.3 Demonstration Monitoring

The three-pile cluster at MW-AQ2 was completed on March 27. Then, 37,650 gallons of water were pumped from the well over a period of eleven days. Killam calculated that pumping a minimum of 36,600 gallons was necessary to move water from the vicinity of the three adjacent piles to the well. The well was permitted to recover for 6 hours, and was then sampled twice on April 8, 1996. The well was purged before each sampling round.

High method detection limits were used for reporting purposes in the early stages of data collection. Incorporation of one-half of these detection limits for nondetected results tended to elevate the calculated 95% UCLs for MW-AQ2. However, in most instances, the UCLs were observed to be less than the ground water criteria levels.

3.4 Evaluation of the Demonstration Monitoring Data

The results of the MW-AQ2 samples are presented in Table 19. The data were compared to the criteria values and 95% UCLs presented in Table 18. Comparing the post-pile driving ("post") data with the baseline data, we note that heavy metals in both data sets are mostly

non-detected and are all below criteria levels. PCBs were not detected in either the baseline or "post" sample sets.

Naphthalene values in the baseline data set averaged 525 ppb, while the "post" data averaged 174 ppb. Similarly, data for acenapthene, fluorene, phenanthrene, anthracene, fluoranthene, and pyrene indicated lower concentrations in the "post" samples as compared to the baseline sample. (Please note that there are no criteria for these compounds.)

For benzo(a)anthracene, the criterion is 2 ppb, and the baseline data set included values of 17 ppb, non-detect (at 11 ppb), and 11 ppb. The "post" samples reflected concentrations of 2 and 3 ppb. The last value is above the criterion but well below the baseline average and 95% UCL (25.46 ppb). Therefore, the "post" samples pass the requirements of the Guidelines document for this contaminant.

The remaining polynuclear aromatic hydrocarbons included in the analytical suite were not detected in either the baseline or "post" samples.

For benzene, the criterion is 5 ppb, and the baseline data set included values of 22, 22, and 22 ppb. With no variation in the data, the average is 22 ppb, as is the 95% UCL. Please note that these samples were taken within a period of 12 hours. The prior samples taken (with air bubbles) reflected a greater degree of variability as well as higher levels (up to 28 ppb, with an average of 25 ppb). The "post" samples contained 20 and 23 ppb of benzene, averaging 21.5 ppb. While the average of the two values lies within the criterion, the second discrete value of 23 exceeds it marginally. Even though the latter value technically exceeds the criterion and 95% UCL, Killam does not ascribe any significance to this exceedence given its marginal extent, the circumstances under which the second set of volatile samples were taken (within 12 hours of each other), the known variability in prior samples (up to 28 ppb), and the overwhelming trend toward lower contaminant concentrations across the board in the "post" samples.

MW-AQ2 was also sampled for mineral spirits, although no criterion for this parameter was set. The baseline data set consistently detected mineral spirits, averaging 1235 ppb with a maximum value of 1370 ppb. The "post" samples reflected a lower mineral spirits concentration of 607 and 766 ppb.

This evaluation of the groundwater quality reflected in the post-pile driving samples indicates that contaminant levels were lower than in the baseline data set for all parameters, except for an insignificant increase in one parameter (benzene) in one out of two samples. Killam considers that these data pass the requirements for success defined in the Guidelines document.

4.0 Conclusions and Recommendations

This section evaluates the results of the Demonstration against the criteria for success (taken from the Guidelines document). For the subtidal Demonstration, Killam believes that the requirements for criterion A-1 are met: "No visual problems and no exceedences of action levels are encountered outside of the area of containment;". Success of the subtidal portion of the Demonstration is conditioned upon the successful installation of the remaining portions of the sand blanket/wedge in the area of the island.

For the upland Demonstration, Killam believes that the requirements for B-1 are met: "Following installation of the three-pile cluster adjacent to monitoring well AQ2, groundwater samples from the sand aquifer do not exceed applicable action levels;".

On the basis of the above, Killam recommends that the City of Charleston request a determination by the NPS that the criteria for success of the Demonstration Program have been met.

TABLES

TABLE 1

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
OCTOBER 23, 1995 SAMPLING EVENT

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1	ADJ-2	ADJ-3	BG-1	BG-2	BG-3	BG-4	RB-1	ADJ-14 (1)
Arsenic	36	35.5	U	U	U	U	U	U	U	U	U
Chromium	50	50	U	U	U	U	U	U	U	U	U
Copper	2.9	2.2	U	U	U	U	U	U	U	U	U
Lead	5.6	5.6	U	U	U	U	U	U	U	U	U
Mercury	0.025	0.02	0.03	U	U	U	U	U	U	U	0.03
Nickel	8.3	7.8	10	9	9.5	8.5	U	8.5	8.2 (B)	U	8.7
Zinc	86	85.6	U	U	U	U	U	U	U	U	U
PCBs											
PCB 1016	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1221	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1232	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1242	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1248	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1254	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1260	0.03	0.03	U	U	U	U	U	U	U	U	U
Dieldrin	0.0019	0.001	U	U	U	U	U	U	U	U	U
DDT	0.001	0.001	U	U	U	U	U	U	U	U	U
DDE	0.001	0.001	U	U	U	U	U	U	U	U	U
Naphthalene	2,350	2	U	U	U	U	U	U	U	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(g,h,I,)Perylene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	U	U	U	U	U	U
Chrysene	0.311	2	U	U	U	U	U	U	U	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Fluoranthene	54	2	U	U	U	U	U	U	U	U	U
Fluorene	0.311	2	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Phenanthrene	0.311	2	U	U	U	U	U	U	U	U	U
Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Acenaphthene	20	2	U	U	U	U	U	U	U	U	U
Acenaphthylene	0.311	2	U	U	U	U	U	U	U	U	U
Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
3,4-Benzofluoranthene (2)	0.311	2	U	U	U	U	U	U	U	U	U
Mineral Spirits	NONE	100	U	U	U	U	U	U	U	U	U

NOTES: (1) ADJ-14 is a duplicate of BG-4.
(2) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank
J	Estimated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 2

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
OCTOBER 25, 1995 SAMPLING EVENT

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1	ADJ-2	ADJ-3	BG-1	BG-2	BG-3	BG-4	RB-1	BG-14 (1)
Arsenic	36	35.5	U	U	U	U	U	U	U	U	U
Chromium	50	50	U,N	U,N	U,N	U,N	U,N	U,N	U,N	U	U,N
Copper	2.9	2.2	U	U	U	U	U	U	U	U	U
Lead	5.6	5.6	U	U	U	U	U	U	U	U	U
Mercury	0.025	0.02	U	U	U	U	U	0.04	0.07	U	U
Nickel	8.3	7.8	8.5 B,N	8.6 B,N	10.5 N	9.9 N	U,N	8.3 B,N	8.7 B,N	U,N	9.0 N
Zinc	86	85.6	U	U	U	U	U	U	U	U	U
PCBs											
PCB 1016	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1221	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1232	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1242	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1248	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1254	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1260	0.03	0.03	U	U	U	U	U	U	U	U	U
Dieldrin	0.0019	0.001	U	U	U	U	U	U	U	U	U
DDT	0.001	0.001	U	U	U	U	U	U	U	U	U
DDE	0.001	0.001	U	U	U	U	U	U	U	U	U
Naphthalene	2,350	2	U	U	U	U	U	U	U	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(g,h,i,)Perylene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	U	U	U	U	U	U
Chrysene	0.311	2	U	U	U	U	U	U	U	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Fluoranthene	54	2	U	U	U	U	U	U	U	U	U
Fluorene	0.311	2	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Phenanthrene	0.311	2	U	U	U	U	U	U	U	U	U
Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Acenaphthene	20	2	U	U	U	U	U	U	U	U	U
Acenaphthylene	0.311	2	U	U	U	U	U	U	U	U	U
Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
3,4-Benzofluoranthene (2)	0.311	2	U	U	U	U	U	U	U	U	U
Mineral Spirits	NONE	100	U	U	U	U	U	U	U	U	U

NOTES: (1) BG-14 is a duplicate of BG-4.
(2) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank
J	Estimated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 3

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
OCTOBER 27, 1995 SAMPLING EVENT

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1	ADJ-2	ADJ-3	BG-1	BG-2	BG-3	BG-4	RB-1	ADJ-13 (1)
Arsenic	36	35.5	U	U	U	NA (2)	NA	NA	NA	U	U
Chromium	50	50	U,N	U,N	U,N	NA	NA	NA	NA	U,N	U,N
Copper	2.9	2.2	U	U	U	NA	NA	NA	NA	U	U
Lead	5.6	5.6	U	U	U	NA	NA	NA	NA	U	U
Mercury	0.025	0.02	U	0.03	U	NA	NA	NA	NA	U	U
Nickel	8.3	7.8	U,N	U,N	U,N	NA	NA	NA	NA	U,N	U,N
Zinc	86	85.6	U	U	U	NA	NA	NA	NA	U	U
PCBs											
PCB 1016	0.03	0.03	U	U	U	NA	NA	NA	NA	U	U
PCB 1221	0.03	0.03	U	U	U	NA	NA	NA	NA	U	U
PCB 1232	0.03	0.03	U	U	U	NA	NA	NA	NA	U	U
PCB 1242	0.03	0.03	U	U	U	NA	NA	NA	NA	U	U
PCB 1248	0.03	0.03	U	U	U	NA	NA	NA	NA	U	U
PCB 1254	0.03	0.03	U	U	U	NA	NA	NA	NA	U	U
PCB 1260	0.03	0.03	U	U	U	NA	NA	NA	NA	U	U
Dieldrin	0.0019	0.001	U	U	U	NA	NA	NA	NA	U	U
DDT	0.001	0.001	U	U	U	NA	NA	NA	NA	U	U
DDE	0.001	0.001	U	U	U	NA	NA	NA	NA	U	U
Naphthalene	2,350	2	U	U	U	NA	NA	NA	NA	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Benzo(g,h,I,)Perylene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Chrysene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Fluoranthene	54	2	U	U	U	NA	NA	NA	NA	U	U
Fluorene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Phenanthrene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Pyrene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Acenaphthene	20	2	U	U	U	NA	NA	NA	NA	U	U
Acenaphthylene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Anthracene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
3,4-Benzofluoranthene (3)	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Mineral Spirits	NONE	100	U	U	U	NA	NA	NA	NA	U	U

NOTES: (1) ADJ-13 is a duplicate of ADJ-3.
(2) Not Analyzed
(3) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank
J	Esitmated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 4

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
MARCH 4, 1996 SAMPLING EVENT

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1	ADJ-2	ADJ-3	BG-1	BG-2	BG-3	BG-4	RB-1	ADJ-4 (1)
Arsenic	36	5.6	U	U	U	U	U	U	U	U	U
Chromium	50	0.7	10.8 (B)	10.9 (B)	12.4	10.2 (B)	12.2	11.4	11.5	1.6 (B)	10.8 (B)
Copper	2.9	1.1	U	U	U	U	U	U	U	U	U
Lead	5.6	2.2	U	U	U	U	U	U	U	U	U
Mercury	0.025	0.02	U	U	U	U	U	U	U	U	U
Nickel	8.3	0.9	8.9 (B)	9.4 (B)	10.7	8.5 (B)	10.3	9.5 (B)	9.6 (B)	2.2(B)	9.7 (B)
Zinc	86	1.1	U	U	1.7 (B)	U	U	4.2 (B)	U	5.8 (B)	50.3
Naphthalene	2,350	2	U	U	U	U	U	U	U	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(g,h,I,)Perylene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	U	U	U	U	U	U
Chrysene	0.311	2	U	U	U	U	U	U	U	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Fluoranthene	54	2	U	U	U	U	U	U	U	U	U
Fluorene	0.311	2	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Phenanthrene	0.311	2	U	U	U	U	U	U	U	U	U
Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Acenaphthene	20	2	U	U	U	U	U	U	U	U	U
Acenaphthylene	0.311	2	U	U	U	U	U	U	U	U	U
Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
3,4-Benzofluoranthene (2)	0.311	2	U	U	U	U	U	U	U	U	U
Mineral Spirits	NONE	100	U	U	U	U	U	U	U	U	U

NOTES: (1) ADJ-4 is a duplicate of ADJ-1.
(2) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank
J	Estimated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 5

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
FIRST MARCH 5, 1996 SAMPLING EVENT

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1	ADJ-2	ADJ-3	BG-1	BG-2	BG-3	BG-4	RB-1	ADJ-4 (1)
Arsenic	36	5.6	U	U	U	NA (2)	NA	NA	NA	U	U
Chromium	50	0.7	12.2	11.8	12.4	NA	NA	NA	NA	2.8 (B)	12.7
Copper	2.9	1.1	U	U	U	NA	NA	NA	NA	2.1 (B)	U
Lead	5.6	2.2	U	U	U	NA	NA	NA	NA	U	U
Mercury	0.025	0.02	U	U	U	NA	NA	NA	NA	U	U
Nickel	8.3	0.9	10.1	9.5 (B)	10.5	NA	NA	NA	NA	3.3 (B)	10.8
Zinc	86	1.1	U	U	U	NA	NA	NA	NA	U	U
Naphthalene	2,350	2	U	U	U	NA	NA	NA	NA	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Benzo(g,h,I,)Perylene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Chrysene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Fluoranthene	54	2	U	U	U	NA	NA	NA	NA	U	U
Fluorene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Phenanthrene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Pyrene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Acenaphthene	20	2	U	U	U	NA	NA	NA	NA	U	U
Acenaphthylene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Anthracene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
3,4-Benzofluoranthene (3)	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Mineral Spirits	NONE	100	U	U	U	NA	NA	NA	NA	U	U

NOTES: (1) ADJ-4 is a duplicate of ADJ-3.
(2) Not Analyzed
(3) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank
J	Estimated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 6

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
SECOND MARCH 5, 1996 SAMPLING EVENT

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1A	ADJ-2A	ADJ-3A	BG-1	BG-2	BG-3	BG-4	RB-1A	ADJ-4A (1)
Arsenic	36	5.6	U	U	U	NA (2)	NA	NA	NA	U	U
Chromium	50	0.7	10.7 (B)	11.7	12.9	NA	NA	NA	NA	1.9 (B)	11.5
Copper	2.9	1.1	U	U	U	NA	NA	NA	NA	1.2 (B)	U
Lead	5.6	2.2	U	U	U	NA	NA	NA	NA	U	U
Mercury	0.025	0.02	U	U	U	NA	NA	NA	NA	U	U
Nickel	8.3	0.9	9.0 (B)	9.6 (B)	10.0	NA	NA	NA	NA	2.4 (B)	9.8 (B)
Zinc	86	1.1	U	U	U	NA	NA	NA	NA	U	U
Naphthalene	2,350	2	U	U	U	NA	NA	NA	NA	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Benzo(g,h,I,)Perylene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Chrysene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Fluoranthene	54	2	U	U	U	NA	NA	NA	NA	U	U
Fluorene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Phenanthrene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Pyrene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Acenaphthene	20	2	U	U	U	NA	NA	NA	NA	U	U
Acenaphthylene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Anthracene	0.311	2	U	U	U	NA	NA	NA	NA	U	U
3,4-Benzofluoranthene (3)	0.311	2	U	U	U	NA	NA	NA	NA	U	U
Mineral Spirits	NONE	100	U	U	U	NA	NA	NA	NA	U	U

NOTES: (1) ADJ-4A is a duplicate of ADJ-1A.
(2) Not Analyzed
(3) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank
J	Estimated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 7
SUMMARY OF TURBIDITY MONITORING DATA

DATE	time	ADJ-1	ADJ-2	ADJ-3	BG-1	BG-2	BG-3	BG-4
10/03/95	1030	10.7	6.1	13.2	11.4	8.9	7.1	10.9
10/04/95	1400	34.8	21.6	18	14	14	22	16.5
10/05/95	1520	36.6	31.4	27.6	19.5	16	33.3	33.2
10/06/95	920	10.6	9.6	8.5	10.6	14.4	17.5	15.5
10/07/95	850	14.1	21	16.8	21	53.4	27.3	39.9
10/08/95	1700	14.6	30.5	36.2	32.9	9.8	45	13.2
10/09/95	1100	13.1	21	18.7	13.2	14.5	26.1	15.6
10/10/95	12x	14.6	21.7	16.8	23.1	22.8	28.3	34.5
10/10/95		24.1	29	21.5	16.8	49.3	20.9	29.5
10/10/95		28.9	27.7	31.5	28.4	91.6	17.7	100.7
10/10/95		34.2	36	19.4	23.5	47	26.1	57
10/10/95		12.6	12.8	14.7	16.7	78.3	14.2	50
10/10/95		10.5	8	9.4	35.7	9.5	17.9	10.5
10/10/95		9.8	10.4	9.4	10	19.9	8.8	15.4
10/10/95		13	12.7	11.7	12	17	12.1	16.9
10/10/95		15.3	14.1	14.4	14.2	17.9	18.4	13.2
10/10/95		14.2	13.8	13.1	15.7	13.8	12.8	12.6
10/10/95		14.1	9.1	20.6	11.3	18.3	22	16.6
10/10/95		16.4	16.9	81	12.5	68.3	9.1	19.9
10/11/95	1100	16	13.4	18.9	55	63.3	48	39
10/12/95	12x	16.9	9.2	9.9	17	9.2	17.3	37.4
10/12/95		17.1	7.1	14.7	15	59.3	22.7	52.6
10/12/95		20.2	8	27.6	22.9	18.5	48.7	30.5
10/12/95		18.4	15.3	33.7	20.2	34.7	23.9	23.1
10/12/95		20.3	27.5	15.7	14.7	60.3	16.6	34.8
10/12/95		12.3	18.9	12.5	44.2	39.4	47.6	44.4
10/12/95		27.1	9.2	14	16.9	8.8	17.9	5.9
10/12/95		13	8.3	9.6	8.5	15.8	10.5	16.3
10/12/95		8.1	8.3	12.6	8.4	16	8.8	8.6
10/12/95		8.8	12.3	18	5.9	15.2	13	8.4
10/12/95		33.8	16.8	11.5	18.2	11.7	13	10.7
10/12/95		27.2	7.5	13.2	26.1	43.5	15.6	9.5
10/13/95	1100	18.3	18	9.6	11.2	41.4	18.4	51.6
10/14/95	1120	13.8	13.9	20.3	16	25.9	16.5	34.1
10/15/95	1400	9.8	14.8	14.3	18.3	14.7	15.8	13.7
10/16/95	12x	6.1	4.5	4.1	5.8	9	3	9
10/16/95		4	5.6	12	3.8	7.2	10.2	6.1
10/16/95		6.1	5.7	5.6	17.4	8.7	12.1	7.2
10/16/95		2.9	3.1	4.2	3.7	5.5	5.7	7.3
10/16/95		4.5	4.2	5.1	3.2	12.7	4.9	10
10/16/95		6.6	4.9	5	3.2	14.9	4.9	30.8
10/16/95		6.5	6.3	11.1	4.5	14.7	6.1	22
10/16/95		8.4	7.9	6.8	10.8	10	8.3	20.7
10/16/95		3.6	5.1	8.6	5.2	4.9	6.1	11.3
10/16/95		2.6	2.6	5.3	3.7	4.4	5.8	7.2
10/16/95		402	259.1	242	34.5	183.2	483	403.2
10/16/95		7	6.6	5.5	107	20.4	10.5	18.8
10/17/95		9.2	7.3	4.7	6	3.8	10.5	5.8
UPPER CONF. LIMITS PER STATION		38.77	33.15	32.66	27.75	31.76	42.09	39.28
UPPER CONF. LIMIT FOR ALL DATA		28.74						

TABLE 8
DETERMINATION OF 95% UPPER CONFIDENCE INTERVAL: ALL STATIONS

PARAMETER	CRITERIA (ug/l)	N	AVERAGE	STANDARD DEVIATION	95% UCL	% OF POSITIVE DETECTIONS	MAXIMUM CONCENTRATION IN DATA SET
Arsenic	36	39	11.84	7.44	14.25	10	20
Chromium	50	39	16.18	8.59	18.96	38	25
Copper	2.9	39	4.94	14.51	9.65	10	76.3
Lead	5.6	39	6.29	13.66	10.72	8	81.1
Mercury	0.025	30	0.01	0.01	0.02	17	0.04
Nickel	8.3	25	9.41	0.74	9.71 *	64	10.7
Zinc	86	39	30.10	31.97	40.46	21	145
PCBs							
PCB 1016	0.03		0.015	0		0	
PCB 1221	0.03		0.015	0		0	
PCB 1232	0.03		0.015	0		0	
PCB 1242	0.03		0.015	0		0	
PCB 1248	0.03		0.015	0		0	
PCB 1254	0.03		0.04	0.11		0	
PCB 1260	0.03		0.04	0.11		0	
Dieldrin	0.0019	18	0.003	0.01	0.01	6	0.053
DDT	0.001	19	0.001	0.003	0.003	11	0.011
DDE	0.001		0.001	0		0	
Naphthalene	2,350		1.13	0.72		0	
Benzo(a)Anthracene	0.311		1.13	0.72		0	
Benzo(a)Pyrene	0.311		1.13	0.72		0	
Benzo(g,h,i,)Perylene	0.311		1.13	0.72		0	
Benzo(k)Fluoranthene	0.311		1.13	0.72		0	
Chrysene	0.311		1.13	0.72		0	
Dibenz(a,h)Anthracene	0.311		1.13	0.72		0	
Fluoranthene	54		1.13	0.72		0	
Fluorene	0.311		1.13	0.72		0	
Indeno(1,2,3-cd)Pyrene	0.311		1.13	0.72		0	
Phenanthrene	0.311		1.13	0.72		0	
Pyrene	0.311		1.13	0.72		0	
Acenaphthene	20		1.13	0.72		0	
Acenaphthylene	0.311		1.13	0.72		0	
Anthracene	0.311		1.13	0.72		0	
3,4-Benzofluoranthene	0.311		1.13	0.72		0	
Mineral Spirits	NONE		50	0		0	

NOTES:

95% UCL not calculated for parameters with all results as non-detect

* = 95% UCL based on detected results only

% OF POSITIVE DETECTIONS = Ratio of positive (greater than MDL) results in data set to total number of results in data set

TABLE 9

DATA USED TO DETERMINE 95% UCL'S FOR ADJ-1, ADJ-2, ADJ-3

PARAMETER	CRITERIA (ug/l)	10/23/95 ADJ-1	10/25/95 ADJ-1	10/27/95 ADJ-1	03/04/96 ADJ-1	03/05/96 ADJ-1	03/06/96 ADJ-1A	Chester SW-12	10/23/95 ADJ-2	10/25/95 ADJ-2	10/27/95 ADJ-2	03/04/96 ADJ-2	03/05/96 ADJ-2	03/06/96 ADJ-2A	10/23/95 ADJ-3	10/25/95 ADJ-3	10/27/95 ADJ-3	03/04/96 ADJ-3	03/05/96 ADJ-3	03/06/96 ADJ-3A	Kitson K-SW-01	PSI SW-03	PSI SW-04	PSI SW-05
Arsenic	36	17.75	17.75	17.75	0.8	0.8	0.8	20	17.75	17.75	17.75	0.8	0.8	0.8	17.75	17.75	17.75	0.8	0.8	0.8	10.3	17	1.7	8.3
Chromium	50	25	25	25	10.8	12.8	11.1	9	25	25	25	10.8	11.8	11.7	25	25	25	12.4	12.65	12.8	8	16.8	3.1	18.6
Copper	2.9	1.1	1.1	1.1	0.55	0.55	0.55	8	1.1	1.1	1.1	0.55	0.55	0.55	1.1	1.1	1.1	0.55	0.55	0.55	4.3	76.3	21.8	50.8
Lead	5.6	5.6	5.6	5.6	1.1	1.1	1.1	10	5.6	5.6	5.6	1.1	1.1	1.1	5.6	5.6	5.6	1.1	1.1	1.1	10	81.1	20	10
Mercury	0.025	0.02	0.01	0.01	0.01	0.01	0.01	-	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-	-	-	-
Nickel	8.3	10	8.5	8.9	8.3	10.1	8.4	7.8	8	8.6	8.9	8.4	8.6	8.6	8.5	10.5	8.9	10.7	10.65	10	7.18	17.35	17.35	17.35
Zinc	86	42.8	42.8	42.8	26.43	0.55	0.55	9.8	42.8	42.8	42.8	0.53	0.55	0.55	42.8	42.8	42.8	1.7	0.55	0.55	37.1	145	30.3	84
PCBs																								
PCB 1016	0.03	0.015	0.015	0.015	NA	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	NA	NA	NA	NA
PCB 1221	0.03	0.015	0.015	0.015	NA	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	NA	NA	NA	NA
PCB 1232	0.03	0.015	0.015	0.015	NA	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	NA	NA	NA	NA
PCB 1242	0.03	0.015	0.015	0.015	NA	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	NA	NA	NA	NA
PCB 1248	0.03	0.015	0.015	0.015	NA	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	NA	NA	NA	NA
PCB 1254	0.03	0.015	0.015	0.015	NA	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	0.5	NA	NA	NA
PCB 1260	0.03	0.015	0.015	0.015	NA	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	0.015	0.015	0.015	NA	NA	NA	0.5	NA	NA	NA
Dieldrin	0.0019	0.0005	0.0005	0.0005	NA	NA	NA	0.05	0.0005	0.0005	0.0005	NA	NA	NA	0.0005	0.0005	0.0005	NA	NA	NA				0.053
DDT	0.001	0.0005	0.0005	0.0005	NA	NA	NA	0.05	0.0005	0.0005	0.0005	NA	NA	NA	0.0005	0.0005	0.0005	NA	NA	NA		0.0055		0.011
DDE	0.001	0.0005	0.0005	0.0005	NA	NA	NA	0.05	0.0005	0.0005	0.0005	NA	NA	NA	0.0005	0.0005	0.0005	NA	NA	NA				
Naphthalene	2,350	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Benzo(a)Anthracene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Benzo(a)Pyrene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Benzo(g,h,i)Perylene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Benzo(k)Fluoranthene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Chrysene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Dibenz(a,h)Anthracene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Fluoranthene	54	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Fluorene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Indeno(1,2,3-cd)Pyrene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Phenanthrene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Pyrene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Acenaphthene	20	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Acenaphthylene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Anthracene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
3,4-Benzofluoranthene	0.311	1	1	1	1	1	1	NA	1	1	1	1	1	1	1	1	1	1	1	1	5	NC	NC	NC
Mineral Spirits	NONE	50	50	50	50	50	50	NA	50	50	50	50	50	50	50	50	50	50	50	50	NA	NA	NA	NA

NOTES:

Shaded area denotes non-detect results evaluated as half of the MDL.

NA = Not Analyzed

NC = Not Included because of high method detection limits

- = Not Detected: With high MDL, not included in calculation

TABLE 9

DATA USED TO DETERMINE 95% UCL'S FOR BG-1, BG-2, BG-3, AND BG-4

PARAMETER	CRITERIA (ug/l)	10/23/95 BG-1	10/23/95 BG-1	10/27/95 BG-1	03/04/96 BG-1	03/05/96 BG-1	03/05/96 BG-1	Chester SW-15	10/23/95 BG-2	10/23/95 BG-2	10/27/95 BG-2	03/04/96 BG-2	03/05/96 BG-2	03/05/96 BG-2	10/23/95 BG-3	10/23/95 BG-3	10/27/95 BG-3	03/04/96 BG-3	03/05/96 BG-3	03/05/96 BG-3	PSI SW-10	Chester SW-13	Chester SW-14	10/23/95 BG-4	10/23/95 BG-4	10/27/95 BG-4	03/04/96 BG-4	03/05/96 BG-4	03/05/96 BG-4
Arsenic	36	17.75	17.75	NA	2.8	NA	NA	20	17.75	17.75	NA	2.8	NA	NA	17.75	17.75	NA	2.8	NA	NA	5.5	20	20	17.75	17.75	NA	2.8	NA	NA
Chromium	50	25	25	NA	10.2	NA	NA	3	25	25	NA	12.2	NA	NA	25	25	NA	11.4	NA	NA	3.1	3	3	25	25	NA	11.5	NA	NA
Copper	2.8	1.1	1.1	NA	0.55	NA	NA	2	1.1	1.1	NA	0.55	NA	NA	1.1	1.1	NA	0.55	NA	NA	6.35	2	2	1.1	1.1	NA	0.55	NA	NA
Lead	5.8	2.8	2.8	NA	1.1	NA	NA	0.5	2.8	2.8	NA	1.1	NA	NA	2.8	2.8	NA	1.1	NA	NA	31.8	10	10	2.8	2.8	NA	1.1	NA	NA
Mercury	0.025	0.01	0.01	NA	0.01	NA	NA	0.2	0.01	0.01	NA	0.01	NA	NA	0.01	0.04	NA	0.01	NA	NA	-	-	-	0.02	0.04	NA	0.01	NA	NA
Nickel	8.3	8.5	9.9	NA	8.5	NA	NA	7.5	3.9	3.9	NA	10.3	NA	NA	8.5	8.3	NA	8.5	NA	NA	17.35	7.5	7.5	8.45	8.85	NA	9.8	NA	NA
Zinc	86	42.8	42.8	NA	0.55	NA	NA	0.5	42.8	42.8	NA	0.55	NA	NA	42.8	42.8	NA	4.2	NA	NA	101	0.5	0.5	42.8	42.8	NA	0.55	NA	NA
PCBs																													
PCB 1016	0.03	0.015	0.015	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA
PCB 1221	0.03	0.015	0.015	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA
PCB 1232	0.03	0.015	0.015	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA
PCB 1242	0.03	0.015	0.015	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA
PCB 1248	0.03	0.015	0.015	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA
PCB 1254	0.03	0.015	0.015	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA
PCB 1260	0.03	0.015	0.015	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA	NA	NA	NA	0.015	0.015	NA	NA	NA	NA
Dieldrin	0.0019	0.0005	0.0005	NA	NA	NA	NA	0.05	0.0005	0.0005	NA	NA	NA	NA	0.0005	0.0005	NA	NA	NA	NA	0.05	0.05	0.05	0.0005	0.0005	NA	NA	NA	NA
DDT	0.001	0.0005	0.0005	NA	NA	NA	NA	0.05	0.0005	0.0005	NA	NA	NA	NA	0.0005	0.0005	NA	NA	NA	NA	0.05	0.05	0.05	0.0005	0.0005	NA	NA	NA	NA
DDE	0.001	0.0005	0.0005	NA	NA	NA	NA	0.05	0.0005	0.0005	NA	NA	NA	NA	0.0005	0.0005	NA	NA	NA	NA	0.05	0.05	0.05	0.0005	0.0005	NA	NA	NA	NA
Naphthalene	2,350	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Benzo(a)Anthracene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Benzo(a)Pyrene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Benzo(g,h,i)Perylene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Benzo(b)Fluoranthene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Chrysene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Dibenz(a,h)Anthracene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Fluoranthene	54	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Fluorene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Indeno(1,2,3-cd)Pyrene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Phenanthrene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Pyrene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Acenaphthene	20	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Acenaphthylene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Anthracene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
3,4-Benzofluoranthene	0.311	1	1	NA	1	NA	NA	NA	1	1	NA	1	NA	NA	1	1	NA	1	NA	NA	NC	NA	NA	1	1	NA	1	NA	NA
Mineral Spirits	NONE	50	50	NA	50	NA	NA	NA	50	50	NA	50	NA	NA	50	50	NA	50	NA	NA	NA	NA	NA	50	50	NA	50	NA	NA

NOTES:

Shaded area denotes non-detect value evaluated as half of the MDL.

NA = Not Analyzed

NC = Not included because of high method detection limit

- = Not Detected; With high MDL, not included in calculation

TABLE 10

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
MARCH 28, 1996 SAMPLING EVENT ("A" SAMPLING ROUND)

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1A	ADJ-2A	ADJ-3A	ADJ4-A (1)	BG-1A	BG-2A	BG-3A	BG-4A	RB-1A
Arsenic	36	5.6	U	U	U	U	U	U	U	U	U
Chromium	50	0.7	5.8 (B)	5.6 (B)	7.5 (B)	6.9 (B)	6.6 (B)	8.0 (B)	7.1 (B)	7.7 (B)	2.4 (B)
Copper	2.9	1.1	U	1.5(B)	4.5 (B)	1.1 (B)	U	U	6.0 (B)	U	U
Lead	5.6	2.2	U	U	5.6	U	U	U	U	U	U
Mercury	0.025	0.02	U	U	U	U	U	U	U	U	U
Nickel	8.3	0.9	3.4 (B)	3.5 (B)	5.2 (B)	4.3 (B)	4.3 (B)	6.5 (B)	5.0 (B)	5.3 (B)	1.4 (B)
Zinc	86	1.1	11.6 (B)	11.1 (B)	22.9	10.5 (B)	9.0 (B)	U	8.8 (B)	3.6 (B)	6.1 (B)
PCBs											
PCB 1016	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1221	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1232	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1242	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1248	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1254	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1260	0.03	0.03	U	U	U	U	U	U	U	U	U
Dieldrin	0.0019	0.001	U	U	U	U	U	U	U	U	U
DDT	0.001	0.001	U	U	U	U	U	U	U	U	U
DDE	0.001	0.001	U	U	U	U	U	U	U	U	U
Naphthalene	2,350	2	U	U	U	U	U	U	U	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(g,h,I,)Perylene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	U	U	U	U	U	U
Chrysene	0.311	2	U	U	U	U	U	U	U	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Fluoranthene	54	2	U	U	U	U	U	U	U	U	U
Fluorene	0.311	2	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Phenanthrene	0.311	2	U	U	U	U	U	U	U	U	U
Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Acenaphthene	20	2	U	U	U	U	U	U	U	U	U
Acenaphthylene	0.311	2	U	U	U	U	U	U	U	U	U
Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
3,4-Benzofluoranthene (2)	0.311	2	U	U	U	U	U	U	U	U	U
Mineral Spirits	NONE	100	U	U	U	U	U	U	U	U	U

NOTES: (1) ADJ-4 is a duplicate of ADJ-1.
(2) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank
J	Estimated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 11

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
MARCH 28, 1996 SAMPLING EVENT ("B" SAMPLING ROUND)

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1B	ADJ-2B	ADJ-3B	ADJ-4B (1)	BG-1B	BG-2B	BG-3B	BG-4B	RB-1B
Arsenic	36	5.6	U	U	U	U	U	U	U	U	U
Chromium	50	0.7	5.9 (B)	7.8 (B)	7.0 (B)	6.9 (B)	6.5 (B)	8.1 (B)	6.6 (B)	7.5 (B)	2.5 (B)
Copper	2.9	1.1	U	U	U	U	U	U	1.3 (B)	U	U
Lead	5.6	2.2	U	U	U	U	U	U	U	U	U
Mercury	0.025	0.02	U	U	U	U	U	U	U	U	U
Nickel	8.3	0.9	3.9 (B)	5.2 (B)	4.7 (B)	4.6 (B)	4.2 (B)	5.6 (B)	4.1 (B)	5.4 (B)	2.1 (B)
Zinc	86	1.1	1.2 (B)	8.8 (B)	6.7 (B)	6.1 (B)	6.4 (B)	13.9 (B)	8.3 (B)	U	7.4 (B)
PCBs											
PCB 1016	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1221	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1232	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1242	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1248	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1254	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1260	0.03	0.03	U	U	U	U	U	U	U	U	U
Dieldrin	0.0019	0.001	U	U	U	U	U	U	U	U	U
DDT	0.001	0.001	U	U	U	U	U	U	U	U	U
DDE	0.001	0.001	U	U	U	U	U	U	U	U	U
Naphthalene	2,350	2	U	U	U	U	U	U	U	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(g,h,I,)Perylene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	U	U	U	U	U	U
Chrysene	0.311	2	U	U	U	U	U	U	U	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Fluoranthene	54	2	U	U	U	U	U	U	U	U	U
Fluorene	0.311	2	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Phenanthrene	0.311	2	U	U	U	U	U	U	U	U	U
Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Acenaphthene	20	2	U	U	U	U	U	U	U	U	U
Acenaphthylene	0.311	2	U	U	U	U	U	U	U	U	U
Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
3,4-Benzofluoranthene (2)	0.311	2	U	U	U	U	U	U	U	U	U
Mineral Spirits	NONE	100	U	U	U	U	U	U	U	U	U

NOTES: (1) ADJ-4 is a duplicate of ADJ-3.
(2) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank
J	Estimated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 12

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
MARCH 28, 1996 SAMPLING EVENT ("C" SAMPLING ROUND)

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1C	ADJ-2C	ADJ-3C	ADJ-4C (1)	BG-1C	BG-2C	BG-3C	BG-4C	RB-1C
Arsenic	36	5.6	U	U	U	U	U	U	U	U	U
Chromium	50	0.7	6.5 (B)	7.4 (B)	7.4 (B)	8.3 (B)	7.3 (B)	7.8 (B)	7.6 (B)	8.1 (B)	2.9 (B)
Copper	2.9	1.1	U	U	U	3.7 (B)	U	U	U	U	U
Lead	5.6	2.2	U	U	U	U	U	U	U	U	U
Mercury	0.025	0.02	U	U	U	U	U	U	U	U	U
Nickel	8.3	0.9	4.4 (B)	5.1 (B)	4.5 (B)	6.3 (B)	5.4 (B)	5.4 (B)	5.3 (B)	5.6 (B)	2.2 (B)
Zinc	86	1.1	6.2 (B)	3.2 (B)	1.7 (B)	5.8 (B)	10.7 (B)	U	3.5 (B)	4.8 (B)	4.5 (B)
PCBs											
PCB 1016	0.03	0.03	U	U	U	U	NA (2)	U	U	U	U
PCB 1221	0.03	0.03	U	U	U	U	NA	U	U	U	U
PCB 1232	0.03	0.03	U	U	U	U	NA	U	U	U	U
PCB 1242	0.03	0.03	U	U	U	U	NA	U	U	U	U
PCB 1248	0.03	0.03	U	U	U	U	NA	U	U	U	U
PCB 1254	0.03	0.03	U	U	U	U	NA	U	U	U	U
PCB 1260	0.03	0.03	U	U	U	U	NA	U	U	U	U
Dieldrin	0.0019	0.001	U	U	U	U	NA	U	U	U	U
DDT	0.001	0.001	U	U	U	U	NA	U	U	U	U
DDE	0.001	0.001	U	U	U	U	NA	U	U	U	U
Naphthalene	2,350	2	U	U	U	U	U	U	U	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(g,h,I,)Perylene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	U	U	U	U	U	U
Chrysene	0.311	2	U	U	U	U	U	U	U	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Fluoranthene	54	2	U	U	U	U	U	U	U	U	U
Fluorene	0.311	2	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Phenanthrene	0.311	2	U	U	U	U	U	U	U	U	U
Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Acenaphthene	20	2	U	U	U	U	U	U	U	U	U
Acenaphthylene	0.311	2	U	U	U	U	U	U	U	U	U
Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
3,4-Benzofluoranthene (3)	0.311	2	U	U	U	U	U	U	U	U	U
Mineral Spirits	NONE	100	U	U	U	U	U	U	U	U	U

NOTES: (1) ADJ-4 is a duplicate of ADJ-3.
(2) Pesticides/PCBs not analyzed because one 1-liter bottle broke in transit.
(3) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank
J	Estimated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 13

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
MARCH 29, 1996 SAMPLING EVENT ("D" SAMPLING ROUND)

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1D	ADJ-2D	ADJ-3D	ADJ-4D (1)	BG-1D	BG-2D	BG-3D	BG-4D	RB-1D
Arsenic	36	5.6	U	U	U	U	U	U	U	U	U
Chromium	50	0.7	7.5 (B)	8.2 (B)	9.4 (B)	12.4	8.4 (B)	8.4 (B)	7.7 (B)	9.1 (B)	1.5 (B)
Copper	2.9	1.1	U	U	U	U	U	U	U	U	U
Lead	5.6	2.2	U	U	U	6.8	U	U	U	U	U
Mercury	0.025	0.02	U	U	U	U	U	U	U	U	U
Nickel	8.3	0.9	4.9 (B)	6.4 (B)	5.8 (B)	5.4 (B)	5.9 (B)	5.9 (B)	5.1 (B)	6.6 (B)	1.2 (B)
Zinc	86	1.1	2.4 (B)	1.6 (B)	14.4 (B)	10.4 (B)	4.8 (B)	11.1 (B)	U	2.8 (B)	6.9 (B)
PCBs											
PCB 1016	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1221	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1232	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1242	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1248	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1254	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1260	0.03	0.03	U	U	U	U	U	U	U	U	U
Dieldrin	0.0019	0.001	U	U	U	U	U	U	U	U	U
DDT	0.001	0.001	U	U	U	U	U	U	U	U	U
DDE	0.001	0.001	U	U	U	U	U	U	U	U	U
Naphthalene	2,350	2	U	U	U	U	U	U	U	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(g,h,I,)Perylene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	U	U	U	U	U	U
Chrysene	0.311	2	U	U	U	U	U	U	U	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Fluoranthene	54	2	U	U	U	U	U	U	U	U	U
Fluorene	0.311	2	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Phenanthrene	0.311	2	U	U	U	U	U	U	U	U	U
Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Acenaphthene	20	2	U	U	U	U	U	U	U	U	U
Acenaphthylene	0.311	2	U	U	U	U	U	U	U	U	U
Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
3,4-Benzofluoranthene (2)	0.311	2	U	U	U	U	U	U	U	U	U
Mineral Spirits	NONE	100	U	U	U	U	U	U	U	U	U

NOTES: (1) ADJ-4 is a duplicate of ADJ-3.
(2) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank.
J	Estimated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 14

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
MARCH 29, 1996 SAMPLING EVENT ("E" SAMPLING ROUND)

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1E	ADJ-2E	ADJ-3E	ADJ-4E (1)	BG-1E	BG-2E	BG-3E	BG-4E	RB-1E
Arsenic	36	5.6	U	U	U	U	U	U	U	U	U
Chromium	50	0.7	7.8 (B)	8.3 (B)	10.3 (B)	8.6 (B)	8.6 (B)	10.1 (B)	8.9 (B)	9.4 (B)	2.2 (B)
Copper	2.9	1.1	U	U	2.8 (B)	U	U	U	U	U	2.0 (B)
Lead	5.6	2.2	U	U	6.8	U	U	U	U	U	U
Mercury	0.025	0.02	U	U	U	U	U	U	U	U	U
Nickel	8.3	0.9	5.1 (B)	5.9 (B)	6.7 (B)	5.7 (B)	6.2 (B)	7.7 (B)	6.1 (B)	7.2 (B)	2.0 (B)
Zinc	86	1.1	U	1.9 (B)	21.3	8.9 (B)	19.7 (B)	2.8 (B)	2.7 (B)	15.5 (B)	7.7 (B)
PCBs											
PCB 1016	0.03	0.03	NA (2)	U	U	U	U	U	U	U	U
PCB 1221	0.03	0.03	NA	U	U	U	U	U	U	U	U
PCB 1232	0.03	0.03	NA	U	U	U	U	U	U	U	U
PCB 1242	0.03	0.03	NA	U	U	U	U	U	U	U	U
PCB 1248	0.03	0.03	NA	U	U	U	U	U	U	U	U
PCB 1254	0.03	0.03	NA	U	U	U	U	U	U	U	U
PCB 1260	0.03	0.03	NA	U	U	U	U	U	U	U	U
Dieldrin	0.0019	0.001	NA	U	U	U	U	U	U	U	U
DDT	0.001	0.001	NA	U	U	U	U	U	U	U	U
DDE	0.001	0.001	NA	U	U	U	U	U	U	U	U
Naphthalene	2,350	2	U	U	U	U	U	U	U	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(g,h,I,)Perylene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	U	U	U	U	U	U
Chrysene	0.311	2	U	U	U	U	U	U	U	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Fluoranthene	54	2	U	U	U	U	U	U	U	U	U
Fluorene	0.311	2	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Phenanthrene	0.311	2	U	U	U	U	U	U	U	U	U
Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Acenaphthene	20	2	U	U	U	U	U	U	U	U	U
Acenaphthylene	0.311	2	U	U	U	U	U	U	U	U	U
Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
3,4-Benzofluoranthene (3)	0.311	2	U	U	U	U	U	U	U	U	U
Mineral Spirits	NONE	100	U	U	U	U	U	U	U	U	U

NOTES: (1) ADJ-4 is a duplicate of ADJ-1.
(2) Pesticides/PCBs not analyzed because one 1-liter bottle broke in transit.
(3) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank
J	Estimated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 15

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
APRIL 3, 1996 SAMPLING EVENT ("F" SAMPLING ROUND)

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1F	ADJ-2F	ADJ-3F	ADJ-4F (1)	BG-1F	BG-2F	BG-3F	BG-4F	RB-1F
Arsenic	36	5.6	U	U	U	U	U	U	U	U	U
Chromium	50	0.7	7.1 (B)	7.8 (B)	17.2	7.8 (B)	8.2 (B)	7.8 (B)	8.4 (B)	8.0 (B)	2.0 (B)
Copper	2.9	1.1	U	U	3.3 (B)	U	U	U	U	U	U
Lead	5.6	2.2	U	U	U	U	U	U	U	U	U
Mercury	0.025	0.02	U	U	U	U	U	U	U	U	U
Nickel	8.3	0.9	4.1 (B)	5.4 (B)	9.7 (B)	5.5 (B)	5.4 (B)	5.1 (B)	5.8 (B)	5.7 (B)	1.3 (B)
Zinc	86	1.1	U	U	14.7 (B)	U	U	U	U	U	2.5 (B)
PCBs											
PCB 1016	0.03	0.03	U	U	U	NA (2)	U	U	U	U	U
PCB 1221	0.03	0.03	U	U	U	NA	U	U	U	U	U
PCB 1232	0.03	0.03	U	U	U	NA	U	U	U	U	U
PCB 1242	0.03	0.03	U	U	U	NA	U	U	U	U	U
PCB 1248	0.03	0.03	U	U	U	NA	U	U	U	U	U
PCB 1254	0.03	0.03	U	U	U	NA	U	U	U	U	U
PCB 1260	0.03	0.03	U	U	U	NA	U	U	U	U	U
Dieldrin	0.0019	0.001	U	U	U	NA	U	U	U	U	U
DDT	0.001	0.001	U	U	U	NA	U	U	U	U	U
DDE	0.001	0.001	U	U	U	NA	U	U	U	U	U
Naphthalene	2,350	2	U	U	U	U	U	U	U	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(g,h,I,)Perylene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	U	U	U	U	U	U
Chrysene	0.311	2	U	U	U	U	U	U	U	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Fluoranthene	54	2	U	U	U	U	U	U	U	U	U
Fluorene	0.311	2	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Phenanthrene	0.311	2	U	U	U	U	U	U	U	U	U
Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Acenaphthene	20	2	U	U	U	U	U	U	U	U	U
Acenaphthylene	0.311	2	U	U	U	U	U	U	U	U	U
Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
3,4-Benzofluoranthene (3)	0.311	2	U	U	U	U	U	U	U	U	U
Mineral Spirits	NONE	100	U	U	U	U	U	U	U	U	U

NOTES: (1) ADJ-4 is a duplicate of BG-1.
(2) Pesticides/PCBs not analyzed because one 1-liter bottle broke in transit.
(3) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank
J	Esitmated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 16

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
APRIL 4, 1996 SAMPLING EVENT ("G" SAMPLING ROUND)

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULTS								
			ADJ-1G	ADJ-2G	ADJ-3G	ADJ-4G (1)	BG-1G	BG-2G	BG-3G	BG-4G	RB-1G
Arsenic	36	5.6	U	U	U	U	U	U	U	U	U
Chromium	50	0.7	8.0 (B)	8.4 (B)	8.4 (B)	8.9 (B)	7.4 (B)	8.2 (B)	10.5 (B)	8.7 (B)	2.7 (B)
Copper	2.9	1.1	U	4.1 (B)	U	U	U	U	U	U	U
Lead	5.6	2.2	U	U	U	U	U	U	U	U	U
Mercury	0.025	0.02	U	U	U	U	U	U	U	U	U
Nickel	8.3	0.9	6.1 (B)	6.0 (B)	6.2 (B)	5.6 (B)	4.5 (B)	5.6 (B)	6.9 (B)	6.5 (B)	1.9 (B)
Zinc	86	1.1	U	U	U	U	U	U	U	U	2.8 (B)
PCBs											
PCB 1016	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1221	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1232	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1242	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1248	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1254	0.03	0.03	U	U	U	U	U	U	U	U	U
PCB 1260	0.03	0.03	U	U	U	U	U	U	U	U	U
Dieldrin	0.0019	0.001	U	U	U	U	U	U	U	U	U
DDT	0.001	0.001	U	U	U	U	U	U	U	U	U
DDE	0.001	0.001	U	U	U	U	U	U	U	U	U
Naphthalene	2,350	2	U	U	U	U	U	U	U	U	U
Benzo(a)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(a)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(g,h,I,)Perylene	0.311	2	U	U	U	U	U	U	U	U	U
Benzo(k)Fluoranthene	0.311	2	U	U	U	U	U	U	U	U	U
Chrysene	0.311	2	U	U	U	U	U	U	U	U	U
Dibenz(a,h)Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
Fluoranthene	54	2	U	U	U	U	U	U	U	U	U
Fluorene	0.311	2	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Phenanthrene	0.311	2	U	U	U	U	U	U	U	U	U
Pyrene	0.311	2	U	U	U	U	U	U	U	U	U
Acenaphthene	20	2	U	U	U	U	U	U	U	U	U
Acenaphthylene	0.311	2	U	U	U	U	U	U	U	U	U
Anthracene	0.311	2	U	U	U	U	U	U	U	U	U
3,4-Benzofluoranthene (2)	0.311	2	U	U	U	U	U	U	U	U	U
Mineral Spirits	NONE	100	U	U	U	U	U	U	U	U	U

NOTES: (1) ADJ-4 is a duplicate of ADJ-1.
(2) 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank.
J	Estimated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 17

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
APRIL 4, 1996 SAMPLING EVENT (INSIDE CONTAINMENT SAMPLE)

PARAMETER	CRITERIA (ug/l)	MDL (ug/l)	RESULT CSW-1
Arsenic	36	5.6	U
Chromium	50	0.7	10.2 (B)
Copper	2.9	1.1	U
Lead	5.6	2.2	U
Mercury	0.025	0.02	U
Nickel	8.3	0.9	7.4 (B)
Zinc	86	1.1	U
PCBs			
PCB 1016	0.03	0.03	U
PCB 1221	0.03	0.03	U
PCB 1232	0.03	0.03	U
PCB 1242	0.03	0.03	U
PCB 1248	0.03	0.03	U
PCB 1254	0.03	0.03	U
PCB 1260	0.03	0.03	U
Dieldrin	0.0019	0.001	U
DDT	0.001	0.001	U
DDE	0.001	0.001	U
Naphthalene	2,350	2	U
Benzo(a)Anthracene	0.311	2	U
Benzo(a)Pyrene	0.311	2	U
Benzo(g,h,i,)Perylene	0.311	2	U
Benzo(k)Fluoranthene	0.311	2	U
Chrysene	0.311	2	U
Dibenz(a,h)Anthracene	0.311	2	U
Fluoranthene	54	2	U
Fluorene	0.311	2	U
Indeno(1,2,3-cd)Pyrene	0.311	2	U
Phenanthrene	0.311	2	U
Pyrene	0.311	2	U
Acenaphthene	20	2	U
Acenaphthylene	0.311	2	U
Anthracene	0.311	2	U
3,4-Benzofluoranthene	0.311	2	U
Mineral Spirits	NONE	100	U

NOTE: 3,4-Benzofluoranthene is Benzo(b)Fluoranthene.

CLP FLAGS

ORGANICS

B	Found in blank
J	Esitmated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

TABLE 18

DETERMINATION OF 95% UPPER CONFIDENCE INTERVAL FOR MW-AQ2

PARAMETER	CRITERIA (ug/l)	MDL (1) (ug/l)	MDL (2) (ug/l)	02/20/96 MW-AQ2	02/21/96 MW-AQ2	02/26/96 MW-AQ2	N	AVERAGE	STANDARD DEVIATION	95% UCL
Antimony	6	5.6	4.4	2.8	2.8	2.2		2.60	0.35	
Arsenic	50	50	4.4	25	25	2.2		17.40	13.16	
Chromium	100	100	1.1	50	50	12.6	3	37.53	21.59	91.18
Copper	1,300	1300	1.1	650	650	0.55		433.52	374.96	
Lead	15	14.4	2.2	7.2	7.2	1.1		5.17	3.52	
Manganese	180	180	1.1	90	90	81.6	3	87.20	4.85	99.25
Zinc	5,000	5000	1.1	2500	2500	35.2	3	1678.40	1423.05	5213.74
PCBs										
PCB 1016	0.5	0.5	0.5	0.25	0.25	0.25		0.25	0	
PCB 1221	0.5	0.5	0.5	0.25	0.25	0.25		0.25	0	
PCB 1232	0.5	0.5	0.5	0.25	0.25	0.25		0.25	0	
PCB 1242	0.5	0.5	0.5	0.25	0.25	0.25		0.25	0	
PCB 1248	0.5	0.5	0.5	0.25	0.25	0.25		0.25	0	
PCB 1254	0.5	0.5	0.5	0.25	0.25	0.25		0.25	0	
PCB 1260	0.5	0.5	0.5	0.25	0.25	0.25		0.25	0	
Benzene *	5	5	5	22	22	22	3	22	0	22
Naphthalene	NONE	11	10	670	445	460	3	525	125.80	837.52
Acenaphthylene	NONE	-	10	NA	NA	5	1	5	NI	NI
Acenaphthene	NONE	-	10	NA	NA	140	1	140	NI	NI
Fluorene	NONE	-	10	NA	NA	90	1	90	NI	NI
Phenanthrene	NONE	-	10	NA	NA	170	1	170	NI	NI
Anthracene	NONE	-	10	NA	NA	17	1	17	NI	NI
Fluoranthene	NONE	-	10	NA	NA	61	1	61	NI	NI
Pyrene	NONE	-	10	NA	NA	41	1	41	NI	NI
Benzo(a)Anthracene	2	11	10	17	5.5	11	3	11.17	5.75	25.46
Chrysene	NONE	11	10	5.5	5.5	5		5.33	0.29	
Benzo(b)Fluoranthene	2	11	10	5.5	5.5	5		5.33	0.29	
Benzo(k)Fluoranthene	NONE	11	10	5.5	5.5	5		5.33	0.29	
Benzo(a)Pyrene	0.2	11	10	5.5	5.5	5		5.33	0.29	
Indeno(1,2,3-cd)Pyrene	NONE	11	10	5.5	5.5	5		5.33	0.29	
Dibenz(a,h)Anthracene	0.2	11	10	5.5	5.5	5		5.33	0.29	
Benzo(g,h,i)perylene	NONE	-	10	NA	NA	5		5	NI	
Mineral Spirits	NONE	100	100	1370	1275	1060	3	1235	158.82	1629.57

NOTES:

MDL (1) = MDL for the 2/20/96 and 2/21/96 Sampling Events
MDL (2) = MDL for the 2/26/96 Sampling Event

Shaded area denotes non-detect result evaluated as half of the MDL
NA = Not Analyzed
NI = Not enough information to perform statistical analysis
* = Results from repeat analysis on benzene (performed on 2/27/96 and twice on 2/28/96) incorporated into this spreadsheet
95% UCL not calculated for parameters with all results as non-detect

Table 19

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
APRIL 8, 1996 SAMPLING EVENTS (1)

PARAMETER	CRITERIA (ug/l)	MWAQ-2A		MWAQ-2B		MWAQ-RB	
		RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)
Antimony	6	U	4.4	U	4.4	U	4.4
Arsenic	50	U	5.6	U	5.6	U	5.6
Chromium	100	11.4	1.1	11.5	1.1	2.6 (B)	1.1
Copper	1,300	U	1.1	U	1.1	U	1.1
Lead	15	U	2.2	U	2.2	U	2.2
Manganese	180	100	1.1	105	1.1	U	1.1
Zinc	5,000	1.2 (B)	1.1	12.2 (B)	1.1	4.1 (B)	1.1
PCBs							
PCB 1016	0.5	U	0.5	U	0.5	U	0.5
PCB 1221	0.5	U	0.5	U	0.5	U	0.5
PCB 1232	0.5	U	0.5	U	0.5	U	0.5
PCB 1242	0.5	U	0.5	U	0.5	U	0.5
PCB 1248	0.5	U	0.5	U	0.5	U	0.5
PCB 1254	0.5	U	0.5	U	0.5	U	0.5
PCB 1260	0.5	U	0.5	U	0.5	U	0.5
Benzene	5	20	5	23	5	U	5
Naphthalene	NONE	97	2	250 (D)	10	U	2
Acenaphthylene	NONE	U	2	U	10	U	2
Acenaphthene	NONE	25	2	52(D)	10	U	2
Fluorene	NONE	13	2	30 (D)	10	U	2
Phenanthrene	NONE	21	2	43 (D)	10	U	2
Anthracene	NONE	2	2	U	10	U	2
Fluoranthene	NONE	17	2	15 (D)	10	U	2
Pyrene	NONE	13	2	11 (D)	10	U	2
Benzo(a)Anthracene	2	2	2	3	2	U	2
Chrysene	NONE	U	2	U	2	U	2
Benzo(b)Fluoranthene	2	U	2	U	2	U	2
Benzo(k)Fluoranthene	NONE	U	2	U	2	U	2
Benzo(a)Pyrene	0.2	U	2	U	2	U	2
Indeno(1,2,3-cd)Pyrene	NONE	U	2	U	2	U	2
Dibenz(a,h)Anthracene	0.2	U	2	U	2	U	2
Benzo(g,h,i)perylene	NONE	U	2	U	2	U	2
Mineral Spirits	NONE	607	100	766	100	U	100

NOTE: (1) MWAQ-2A AND MWAQ-2B ARE SEPARATE SAMPLING EVENTS ON THE SAME DAY

CLP FLAGS

ORGANICS		METALS
B	Found in blank	B
J	Estimated value, below quantitation limit.	
U	Not detected.	U
BJ	Found in blank and below quantitation limit.	N
D	Sample diluted.	

APPENDIX A

SUBTIDAL SAMPLING OBSERVATIONS AND NOTES

SUMMARY OF SUBTIDAL DEMONSTRATION PROGRAM SURFACE WATER SAMPLING EVENTS SOUTH CAROLINA AQUARIUM CHARLESTON, SOUTH CAROLINA

"A" SAMPLING ROUND

DATE: 3-28-96

ACTIVITY: Setting four piles at cluster C-4.

TIDE: Low / Incoming

SAMPLE DURATION: 0943 thru 1112

SITE OBSERVATIONS:

(1) All four piles set were set in the dry.
(2) Pile work started immediately after a lengthy period of moderately heavy rainfall and the storm drain on the south side of the site was flowing heavily.
(3) The storm drain water appeared black and showed evidence of contamination as was noted by spots of a sheen. This stormwater visibly affected locations ADJ-3 and BG-3.
(4) An off-site sheen was noted and was evident at locations ADJ-1, ADJ-2, ADJ-3, BG-2 and BG-3.

"B" SAMPLING ROUND

DATE: 3-28-96

ACTIVITY: Setting last pile at cluster C-4 and disassembling part of template.

TIDE: High / Incoming

SAMPLE DURATION: 1405 thru 1530

SITE OBSERVATIONS:

(1) Pile was set in subtidal condition.
(2) Storm drain was discharging black water and was visibly affecting locations BG-3 and ADJ-3.

"C" SAMPLING ROUND

DATE: 3-28-96

ACTIVITY: Initial driving of two piles at cluster C-4.

TIDE: High / Outgoing

SAMPLE DURATION: 1606 thru 1710

SITE OBSERVATIONS:

(1) Piles were driven in subtidal condition.

"D" SAMPLING ROUND

DATE: 3-29-96

ACTIVITY: Driving two piles to tip elevation at cluster C-4.

TIDE: Low / Incoming

SAMPLE DURATION: 0807 thru 0910

SITE OBSERVATIONS:

(1) Piles were driven in the dry.
(2) Trash and black water were noted at storm drain area affecting locations BG-3 and ADJ-3.

"E" SAMPLING ROUND

DATE: 3-29-96

ACTIVITY: After pile driving at cluster C-4.

TIDE: Low / Incoming

SAMPLE DURATION: 1017 thru 1121

SITE OBSERVATIONS:

(1) A sheen was noted off site (outside of silt curtain).
(2) Black water from storm drain visually appeared to be affecting location ADJ-3 as was evidenced by leaves and dark sediment on the outside of the silt curtain.

"E" SAMPLING ROUND

DATE: 4-3-96

ACTIVITY: Drove one pile at cluster C-2/3.

TIDE: Low / Incoming

SAMPLE DURATION: 1337 thru 1426

SITE OBSERVATIONS:

(1) Pile was driven in the dry.
(2) Evidenced high turbidity at locations ADJ-3 (105.7NTU) and ADJ-2 (19.8NTU). Turbidity appeared to be created by strong wave action breaking on soft sediments on south side of site and not from pile driving operation.

"G" SAMPLING ROUND

DATE: 4-4-96

ACTIVITY: After pile driving at cluster C-2/3.

TIDE: Low / Incoming

SAMPLE DURATION: 1447 thru 1600

SITE OBSERVATIONS:

(1) Tide was low and water was turbid from wave action on south side of site breaking on soft sediments.

CSW-1 SAMPLING ROUND

DATE: 4-4-96

ACTIVITY: Driving one pile at cluster C-2/3.

TIDE: Medium / Outgoing

SAMPLE DURATION: 1115 thru 1135

SITE OBSERVATIONS:

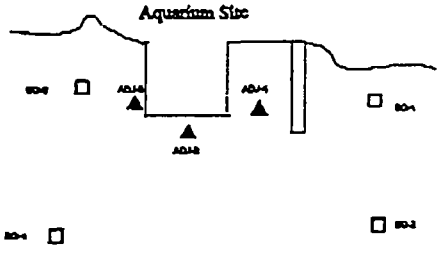
(1) Pile was being driven in the dry.

SURFACE WATER SAMPLE INFORMATION SHEET
THE SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
PROJECT NUMBER- 1134-95-518

General

Sampled by: Todd Tumbleston
Sampling event: "A" Round
Date sampled: March 28, 96
Weather: Cloudy Calm
Number of samples: 9
Total hours: —
Total miles: —

Breif Sketch of Sample Locations



Sample data:

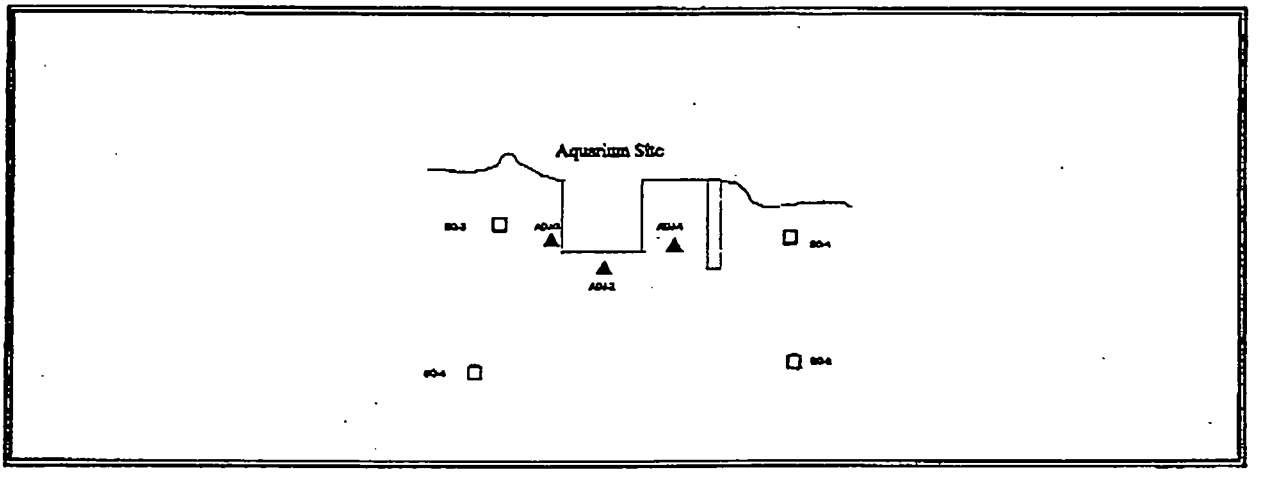
Location	Time Collected	Depth Collected	No. of containers	River flow direction	Tide height
ADJ-1	1022	3	7	IN	LOW
ADJ-2	1010	5	7	"	"
ADJ-3	1000	3	7	"	"
BG-1	1040	3	7	"	"
BG-2	1057	14	7	"	"
BG-3	0943	3	7	"	"
BG-4	1112	14	7	"	"
ADJ-4	1022	DUPLICATE	OF Adj-1		
RB-1	1045	N/A	N/A	N/A	N/A

SURFACE WATER SAMPLE INFORMATION SHEET
THE SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
PROJECT NUMBER- 1134-95-518

General

Sampled by: Todd Jumbleston Weather: Sunny
Sampling event: "B" Round Number of samples: 9
Date sampled: MAR 28, 96 Total hours: 1 Total miles: 1

Breif Sketch of Sample Locations



Sample data:

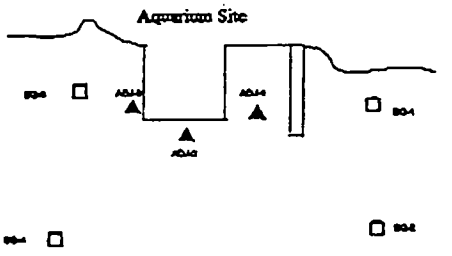
Locations	Time Collected	Depth Collected	No. of containers	River flow direction	Tide height
ADJ-1	1444	3.0	7	IN	HIGH
ADJ-2	1452	4.0	7	"	"
ADJ-3	1502	3.0	7	"	"
BG-1	1431	3.0	7	"	"
BG-2	1424	14.0	7	"	"
BG-3	1405	3.0	7	"	"
BG-4	1518	14.0	7	"	"
ADJ-4	1413	DUPLICATE	OF Adj-3		
RB-1	1530	N/A	N/A	N/A	N/A

SURFACE WATER SAMPLE INFORMATION SHEET
THE SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
PROJECT NUMBER- 1134-95-518

General

Sampled by: Todd Tumbleston
Sampling event: "C" Round
Date sampled: Mar 28, 96
Weather: Cloudy
Number of samples: 9
Total hours: / Total miles: /

Breif Sketch of Sample Locations



Sample data:

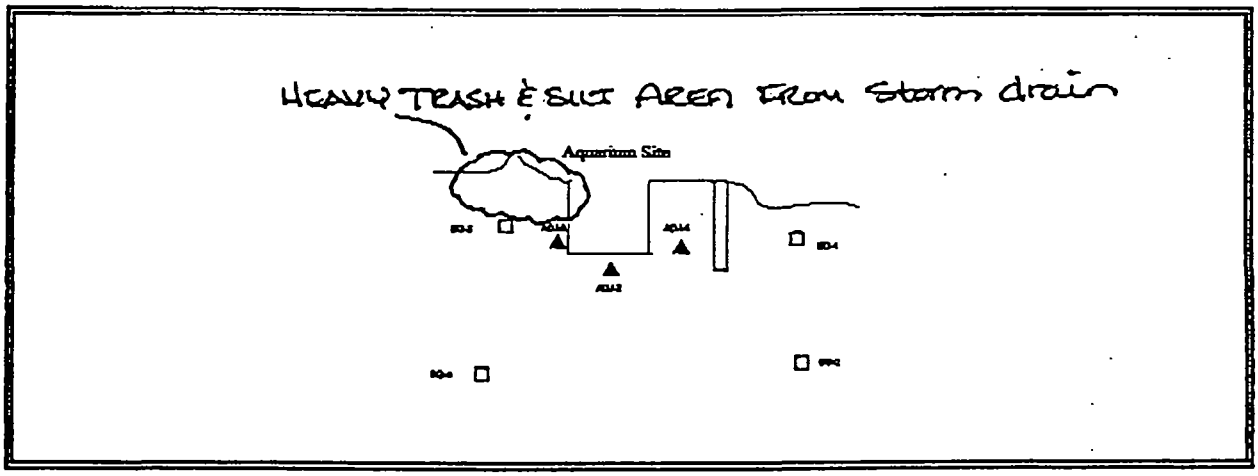
Location	Time Collected	Depth Collected	No. of containers	River flow direction	Tide height
ADJ-I	1643	4.0	7	Out	High
ADJ-2	1647	4.0	7	"	"
ADJ-3	1708	3.0	7	"	"
BG-1	1635	3.0	7	"	"
BG-2	1626	14.0	7	"	"
BG-3	1613	3.0	7	"	"
BG-4	1606	14.0	7	"	"
ADJ-4	1710	DUPLICATE	OF Adj-3		
RB-1	1650	N/A	N/A	N/A	N/A

SURFACE WATER SAMPLE INFORMATION SHEET
THE SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
PROJECT NUMBER- 1134-95-518

General

Sampled by: Todd Templeton
Sampling event: "D" Round
Date sampled: Mar 29 96
Weather: Cloudy/Cool
Number of samples: 9
Total hours: /
Total miles: /

Breif Sketch of Sample Locations



Sample data:

Location	Time Collected	Depth Collected	No. of containers	River flow direction	Tide height
ADJ-1	0834	3.0	7	Out	Low
ADJ-2	0821	5.0	7	"	"
ADJ-3	0807	3.0	7	"	"
BG-1	0844	3.0	7	"	"
BG-2	0852	14.0	7	"	"
BG-3	0910	3.0	7	"	"
BG-4	0902	14.0	7	"	"
ADJ-4	0810	DUPLICATE	OF Adj-3	"	"
RB-1	0830	N/A	N/A	N/A	N/A

SURFACE WATER SAMPLE INFORMATION SHEET
THE SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
PROJECT NUMBER- 1134-95-518

General

Sampled by: Jodd Dunbeston Weather: Sunny Cool
Sampling event: "E" Round Number of samples: 9
Date sampled: Mar 29 96 Total hours: / Total miles: /

Breif Sketch of Sample Locations

Sample data:

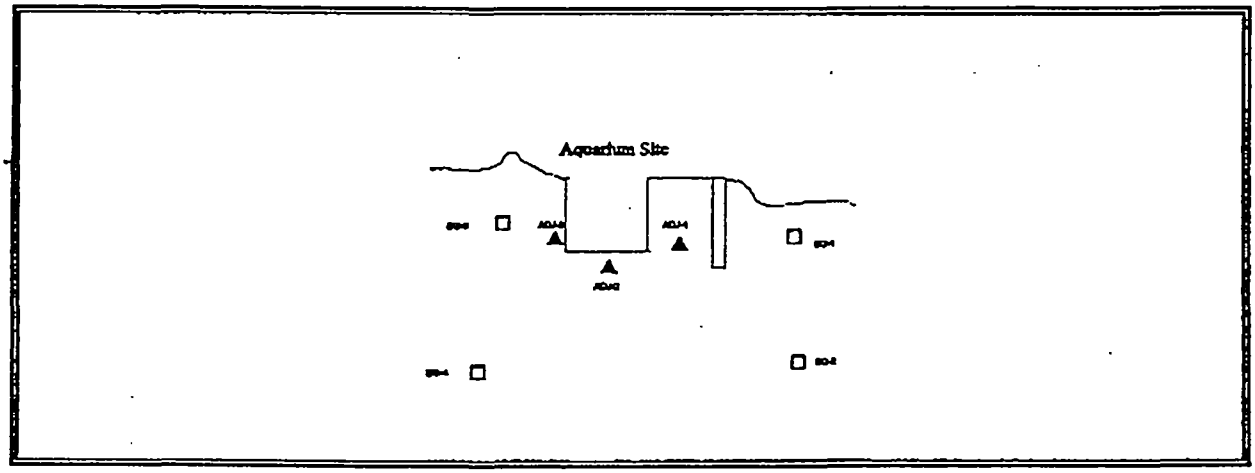
Location	Time Collected	Depth Collected	No. of containers	River flow direction	Tide Height
ADJ-1	1109	3.0	7	~~EBB~~ IN	Low
ADJ-2	1054	5.0	7	"	"
ADJ-3	1044	3.0	7	"	"
BG-1	1036	3.0	7	"	"
BG-2	1028	14.0	7	"	"
BG-3	1121	3.0	7	"	"
BG-4	1017	14.0	7	"	"
ADJ-4	1050	DUPLICATE	OF Adj-1	"	"
RB-1	1059	N/A	N/A	N/A	N/A

SURFACE WATER SAMPLE INFORMATION SHEET
THE SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
PROJECT NUMBER- 1134-95-518

General

Sampled by: Tom Tumbleston
Weather: Sunny Cool
Sampling event: "F" ROUND
Number of samples: 9
Date sampled: APRIL 3,96
Total hours: ~ Total miles: ~

Breif Sketch of Sample Locations



Sample data:

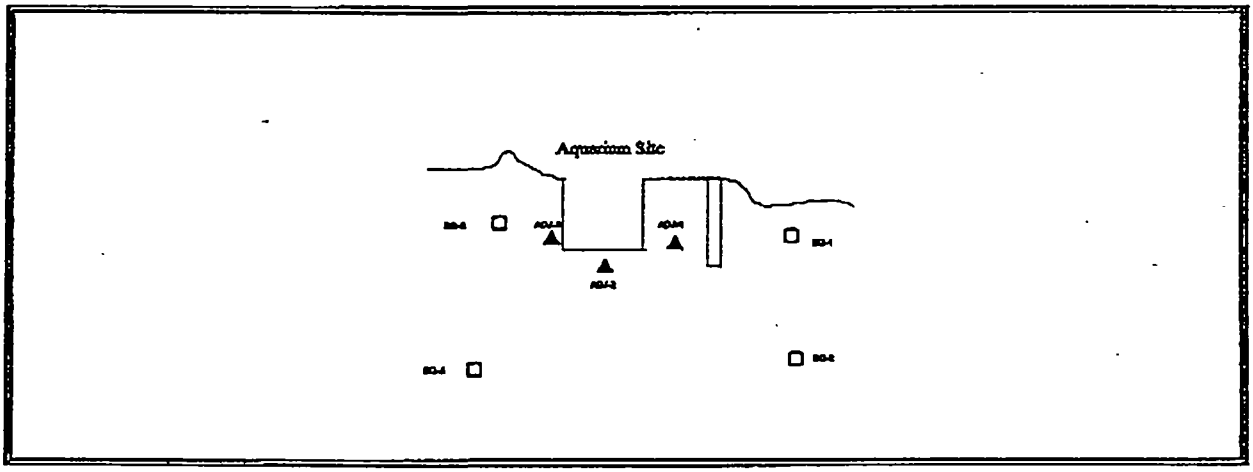
Location	Time Collected	Depth Collected	No. of containers	River flow direction	Tide height
ADJ-1	1346	3	7	Out IN	Very Low
ADJ-2	1337	5	7	"	"
ADJ-3	1328	3	7	"	"
BG-1	1354	3	7	"	"
BG-2	1406	14	7	"	"
BG-3	1426	3	7	"	"
BG-4	1417	14	7	"	"
ADJ-4	1359	DUPLICATE	OF BG-1		
RB-1	1410	N/A	N/A	N/A	N/A

SURFACE WATER SAMPLE INFORMATION SHEET
THE SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
PROJECT NUMBER- 1134-95-518

General

Sampled by: Todd Tumbleston
Sampling event: "G" Round
Date sampled: April 4, 96
Weather: Sunny Warm
Number of samples: 9
Total hours: ~ Total miles: ~

Breif Sketch of Sample Locations



Sample data:

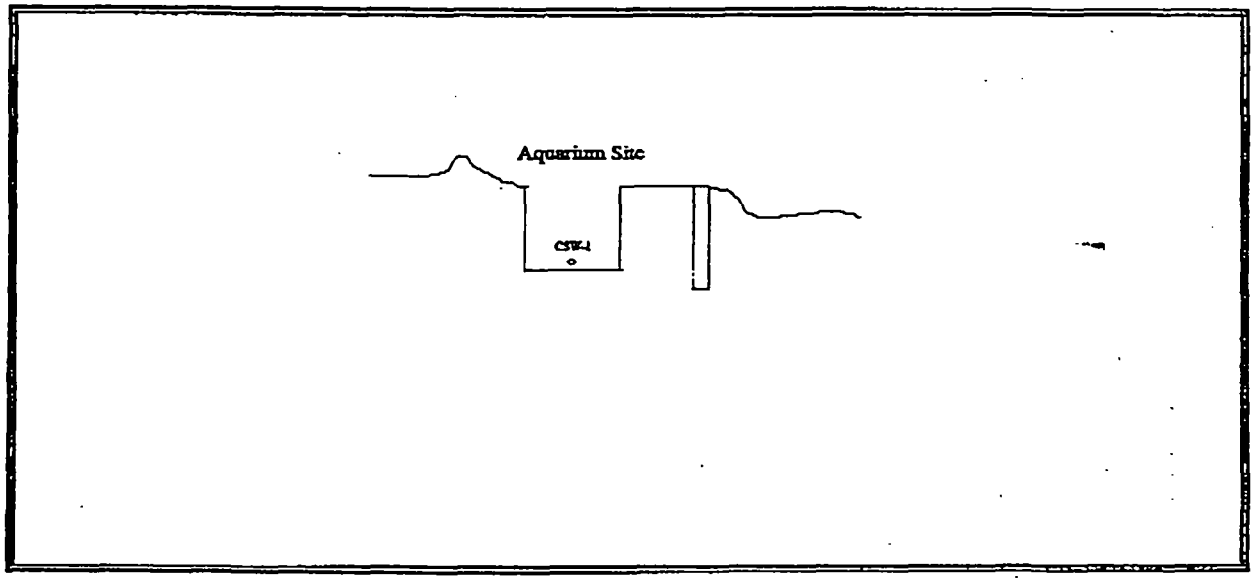
Location	Time Collected	Depth Collected	No. of containers	River flow direction	Tide height
ADJ-1	1519	3	7	In	Med/Low
ADJ-2	1538	5	"	"	"
ADJ-3	1541	3	"	"	"
BG-1	1508	3	"	"	"
BG-2	1554	14	"	"	"
BG-3	1500	3	"	"	"
BG-4	1447	14	"	"	"
ADJ-4	1548	DUPLICATE	OF Adj-3	"	"
RB-1	1600	N/A	N/A	N/A	N/A

SURFACE WATER SAMPLE INFORMATION SHEET
THE SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
PROJECT NUMBER- 1134-95-518

General

Sampled by: Sonny Chestnut
Weather: Sunny, Warm
Sampling event: Inside Containment
Number of samples: 1
Date sampled: 4-4-96
Total hours: /
Total miles: /

Breif Sketch of Sample Locations



Sample data:

Location	Time Collected	Depth Collected	No. of Containers	River Flow Direction	Tide Height
CSW-1	1115	2	7	Out	Medium

COMMENTS:

APPENDIX B

TURBIDITY DATA COLLECTED DURING SUBTIDAL SAMPLING

TURBIDITY MONITORING DATA SHEET
SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
DATE: March 28, 96

MONITORING EVENT (CIRCLE ONE) (1) 2 3 4 OTHER:_____

MONITORING STATION	TIME (2400HRS)	TURBIDITY (NTU)	COMMENTS
ADJ-1	1022	8.8	(Duplicated as adj-4) (3.0')
ADJ-2	1010	7.1	(5.0)
ADJ-3	1000	19.8	Out ≈ 50' (3.0)
BG-1	1040	8.1	Out ≈ 20' (3.0)
BG-2	1057	5.5	(14.0)
BG-3	0943	11.5	Out ≈ 75' (3.0)
BG-4	1112	6.1	(14.0)

RIVER FLOW DIRECTION CIRCLE ONE	TO THE: SOUTH(OUTGOING TIDE) ~~NORTH(INCOMING TIDE)~~
WIND DIRECTION CIRCLE ONE	FROM THE: N NE E SE S SW (W) NW

WEATHER CONDITIONS: Calm, Cloudy, Warm, Rain

SITE ACTIVITY: Repair oct 4 piles into template and dropped ≈ 40' below grade - during this round -

ALL LOCATIONS SAMPLED ROUND "A"

MEASURED BY: Todd Tumbleston SIGNATURE: Todd Tumbleston

REVIEWED BY: [illegible]

TURBIDITY MONITORING DATA SHEET
SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
DATE: Mar 28 96

MONITORING EVENT (CIRCLE ONE) 1 (2) 3 4 OTHER:_____

MONITORING STATION	TIME (2400HRS)	TURBIDITY (NTU)	COMMENTS
ADJ-1	1444	6.5	(3.0)
ADJ-2	1452	6.2	(5.0)
ADJ-3	1502	8.5	DUPLICATED AS ADJ-4 (3.0)
BG-1	1431	7.9	(3.0)
BG-2	1424	6.3	(14.0)
BG-3	1405	10.8	(3.0)
BG-4	1413	8.5	(14.0

RIVER FLOW DIRECTION CIRCLE ONE	TO THE: SOUTH(OUTGOING TIDE) NORTH(INCOMING TIDE)
WIND DIRECTION CIRCLE ONE	FROM THE: (N) NE E SE S SW W NW Moderate

WEATHER CONDITIONS: Cloudy Cool

SITE ACTIVITY: Republic set 5th pile and disassembled portion of the template

"2nd SAMPLE ROUND" (B)

MEASURED BY: Todd Tumblestone SIGNATURE: Todd Tumblestone

REVIEWED BY: AC

TURBIDITY MONITORING DATA SHEET
SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
DATE: MAR 28 06

MONITORING EVENT (CIRCLE ONE) 1 2 (3) 4 OTHER:_____

MONITORING STATION	TIME (2400HRS)	TURBIDITY (NTU)	COMMENTS
ADJ-1	1643	6.4	
ADJ-2	1647	8.6	
ADJ-3	1708	10.6	duplicated as Adj-4
BG-1	1635	4.9	
BG-2	1626	6.8	
BG-3	1613	6.8	
BG-4	1606	8.6	

RIVER FLOW DIRECTION CIRCLE ONE	TO THE: (SOUTH(OUTGOING TIDE)) NORTH(INCOMING TIDE)
WIND DIRECTION CIRCLE ONE	FROM THE: N (NE) E SE S SW W NW

WEATHER CONDITIONS: Cloudy, moderate wind

SITE ACTIVITY: Repubir Started driving piles @ 1625 first blow struck on 1st pile driven

SAMPLE ROUND "C"

MEASURED BY: Todd Tumbleston SIGNATURE: [signature]

REVIEWED BY: AC

TURBIDITY MONITORING DATA SHEET
SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
DATE: MARCH 29, 96

MONITORING EVENT (CIRCLE ONE) (1) 2 3 4 OTHER:_____

MONITORING STATION	TIME (2400HRS)	TURBIDITY (NTU)	COMMENTS
ADJ-1	0834	7.0	
ADJ-2	0821	6.1	
ADJ-3	0807	6.6	Out ≈50' Duplicated as Adj-4
BG-1	0844	7.6	Out ≈20'
BG-2	0852	11.8	
BG-3	0910	5.9	Out ≈75'
BG-4	0902	6.7	

RIVER FLOW DIRECTION CIRCLE ONE	TO THE: (SOUTH(OUTGOING TIDE)) NORTH(INCOMING TIDE)
WIND DIRECTION CIRCLE ONE	FROM THE: (N) NE E SE S SW W NW Mild

WEATHER CONDITIONS: Cloudy, mild wind Cool-

SITE ACTIVITY: REPUBLIC STARTED DRIVING 1ST OF LAST 2 PILES – S. Side of site is very trashy from storm drain – TRASH, SILT, LEAVES

SAMPLE EVENT # 4 (D)

Republic finished driving both piles during event –

MEASURED BY: Todd Tumbleston **SIGNATURE:**

REVIEWED BY: AC

TURBIDITY MONITORING DATA SHEET
SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
DATE: MARCH 29, 96

MONITORING EVENT (CIRCLE ONE) 1 (2) 3 4 OTHER:_____

MONITORING STATION	TIME (2400HRS)	TURBIDITY (NTU)	COMMENTS
ADJ-1	1044	7.5	DUPLICATED AS ADJ-1
ADJ-2	1054	4.8	
ADJ-3	1009	8.7	
BG-1	1036	5.7	
BG-2	1028	7.5	
BG-3	1121	7.5	
BG-4	1017	7.1	

RIVER FLOW DIRECTION CIRCLE ONE	TO THE: SOUTH(OUTGOING TIDE) (NORTH)(INCOMING TIDE)
WIND DIRECTION CIRCLE ONE	FROM THE: (N) NE E SE S SW W NW

WEATHER CONDITIONS: CLOUDY, COOL

SITE ACTIVITY: REPUBLIC BUILDING CRANE BRIDGE
"NO SUBTIDAL ACTIVITY"
SAMPLE ROUND F (5th round)

MEASURED BY: Todd Tumbleston SIGNATURE: Todd Tumbleston

REVIEWED BY: AC

TURBIDITY MONITORING DATA SHEET
SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
DATE: April 3, 96

MONITORING EVENT (CIRCLE ONE) 1 2 (3) 4 OTHER: Sample Round F

MONITORING STATION	TIME (2400HRS)	TURBIDITY (NTU)	COMMENTS
ADJ-1	1346	9.1	
ADJ-2	1337	19.8	
ADJ-3	1328	105.7	Out ~ 50'
BG-1	1354	6.6	Out ~ 20'
BG-2	1406	9.2	
BG-3	1426	7.5	Out ~ 75'
BG-4	1417	7.8	

RIVER FLOW DIRECTION (CIRCLE ONE)	TO THE: SOUTH(OUTGOING TIDE) (NORTH(INCOMING TIDE))
WIND DIRECTION	FROM THE: N NE E SE (S SW) W NW

WEATHER CONDITIONS: Sunny, Windy

SITE ACTIVITY: Tide Out - Very Low
Reference elevation driving pile @ 1325.
Sampled all locations ADJ-4 is duplicate of BG-1

MEASURED BY: Todd Trumbeston **SIGNATURE:**

REVIEWED BY:

TURBIDITY MONITORING DATA SHEET
SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA
DATE: April 4, 96

MONITORING EVENT (CIRCLE ONE) 1 (2) 3 4 OTHER:_____

MONITORING STATION	TIME (2400HRS)	TURBIDITY (NTU)	COMMENTS
ADJ-1	1519	14.8	
ADJ-2	1558	15.6	
ADJ-3	1541	16.9	Out ~ 50' duplicated as Adj-1
BG-1	1508	8.9	Out ~ 20'
BG-2	1500	7.7	
BG-3	1554	38.2	Out ~ 75' ~~Duplic.~~
BG-4	1447	19.0	

RIVER FLOW DIRECTION	TO THE: SOUTH(OUTGOING TIDE) (NORTH(INCOMING TIDE)
WIND DIRECTION	FROM THE: N NE E SE (S) SW W NW Moderate

WEATHER CONDITIONS: Sunny, Warm.

SITE ACTIVITY: NO SUB-TIDAL ACTIVITY

~~Final (7th)~~ SURFACE WATER SAMPLING ~~Event~~ — ROUND "A"

MEASURED BY: Todd Tumbleston SIGNATURE: [signature]

REVIEWED BY: [signature]

TURBIDITY MONITORING DATA SHEET
SOUTH CAROLINA AQUARIUM
CHARLESTON, SOUTH CAROLINA

DATE: April 4 96

MONITORING EVENT (CIRCLE ONE) (1) 2 3 4 OTHER:_____

MONITORING STATION	TIME (2400HRS)	TURBIDITY (NTU)	COMMENTS
ADJ-1	1118	13.9	
ADJ-2	1117	14.3	
ADJ-3	1116	23.1	Out = 50'
BG-1	1119	14.3	Out = 70'
BG-2	1120	16.9	
BG-3	1115	51.4	Out = 75'
BG-4	1122	12.3	

RIVER FLOW DIRECTION (CIRCLE ONE)	TO THE: (SOUTH(OUTGOING TIDE)) NORTH(INCOMING TIDE)
WIND DIRECTION (CIRCLE ONE)	FROM THE: N NE E SE S (SW) W NW

WEATHER CONDITIONS: Sunny Warm

SITE ACTIVITY: Republic Drove Last of the Sub-tidal Demonstration Piles - Sorry Collected the Inside Containment Sample.

CSW-1 ROUND

MEASURED BY: Todd Tumbleston SIGNATURE: Todd Tumbleston

REVIEWED BY: TC

APPENDIX C

SAND CORE REPORTS

S&ME

MEMORANDUM

TO: MIKE SHAKESPEAR

FROM: SONNY CHESTNUT

DATE: APRIL 1, 1996

SUBJECT: SAND CORES AFTER DRIVING OF CLUSTER C-4

As required by the Environmental Monitoring and Response Plan, S&ME collected three sand cores adjacent to pile cluster C-4 after the concrete piles were driven. Two of the sand cores were collected on March 29, 1996 and the third sand core was collected on April 1, 1996.

On March 29th, the first sand core was collected two feet south of the centerline of pile U46. The thickness of this sand core was found to be 45.5 inches and it was observed that there was a 4-inch zone of light migration of the silt into the sand. The second sand core, collected on March 29th, was collected on the centerline between U42 and U44. This location is within 3-feet of both U42 and U44. This sand core was found to contain 46.5 inches of sand and had an approximate 2-inch zone of light migration of the silt into the sand. The third sand core, collected on April 1st, was collected 2-feet north of U42 and was found to contain 43.0 inches of sand with and approximate 4-inch zone of moderate migration of silt into the sand.

Based on these observations, I feel the pile driving at cluster C-4 has not significantly affected the integrity of the sand blanket. The migration of silt into the sand blanket was minimal ranging between 2 and 4 inches. The tolerance specified in the Environmental Monitoring and Response Plan (two thirds of the thickness of the sand blanket) at these locations ranges between 28.6 and 31.0 inches.

cc: Dennis Suler
Ellis Don
Carl Wang
Twiggs Randal

S&ME, Inc. 840 Low Country Boulevard, Mt. Pleasant, South Carolina 29464, (803) 884-0005, Fax (803) 881-6149

Printed on Recycled Paper

S&ME

MEMORANDUM

TO: MIKE SHAKESPEAR

FROM: SONNY CHESTNUT

DATE: MARCH 22, 1996

SUBJECT: SAND CORES AROUND 1ST BENT OF BRIDGE

As was requested in Steve Moore's March 15, 1996 letter, S&ME collected sand cores in the immediate area of the first eight pipe piles driven (first bent) to determine the effect of this additional construction. The first sand core was collected on March 18, 1996 in between the proposed pipe piles (within three feet of the proposed pipe pile locations). Upon collecting this core it was determined that the sand thickness in this area was 79.5 inches. The sand appeared to be clean the entire column depth and there was a distinct line between the sand and the underlying silts.

Upon driving the pipe piles (completed March 21, 1996), we collected an additional sand core in this area on March 22, 1996. This sand core was collected between two of the driven pipe piles and 24-inches from one of the piles. The sand in this area was found to be 73.5 inches in thickness and again was found to be a clean sand with a distinct line at the sand/silt interface. There appeared to be no movement of silts into the sand blanket.

Based on these visual observations, it appears that the driving of the pipe piles has not had any adverse affect on the sand blanket. The driving action does create a downward cone (approximately 6-8 inches). This cone does fill back in through tide action and is not felt to be a concern. The sand cores are being stored in our on-site trailer should anyone want visually inspect them.

cc: Dennis Suler
Ellis Don
Carl Wang
Twiggs Randal

S&ME, Inc. 840 Low Country Boulevard, Mt. Pleasant, South Carolina 29464, (803) 884-0005, Fax (803) 881-6149

Printed on Recycled Paper

S&ME

MEMORANDUM

TO: MIKE SHAKESPEAR

FROM: SONNY CHESTNUT

DATE: APRIL 1, 1996

SUBJECT: SAND CORES AROUND 2ND BENT OF BRIDGE

As was requested in Steve Moore's March 15, 1996 letter, S&ME collected sand cores in the immediate area of the second cluster of pipe piles driven (second bent) to document conditions before driving concrete piles at cluster C-2/3. The first sand core was collected on this date 3-feet immediately west of the southernmost pipe pile in this cluster. This sand core was found to contain 43.5 inches of sand and an approximate 2-inch zone of light silt migration into the sand. To verify that the sand blanket met the specified thickness, one additional sand core was collected on the northern end of this bent. This sand core was collected 3-feet east of the northernmost pipe pile. The sand thickness at this location was 49.5 inches with an approximate 2-inch zone of light migration of the silts into the sand.

Upon completion of the pile driving activities at cluster C-2/3, we will collect three sand cores surrounding the concrete piles (within three feet of the piles). This will document the effect that the pile driving activities had on the sand blanket. These sand cores will be collected on April 3rd or April 4th (schedule permitting).

cc: Dennis Suler
Ellis Don
Carl Wang
Twiggs Randal

S&ME, Inc. 840 Low Country Boulevard, Mt. Pleasant, South Carolina 29464, (803) 884-0005, Fax (803) 881-6149

Printed on Recycled Paper

S&ME

MEMORANDUM

TO: MIKE SHAKESPEAR

FROM: SONNY CHESTNUT

DATE: APRIL 5, 1996

SUBJECT: SAND CORES AFTER DRIVING OF CLUSTER C-2\3

As required by the Environmental Monitoring and Response Plan, S&ME collected three sand cores adjacent to pile cluster C-2\3 after the concrete piles were driven. These sand cores were collected on April 4, 1996.

The first sand core was collected two feet north of the centerline of pile U51. The thickness of this sand core was found to be 51.0 inches and it was observed that there was a 2-inch zone of light migration of the silt into the sand. The second sand core was collected two feet south of U53. This sand core was found to contain 46.0 inches of sand and had an approximate 6-inch zone of migration of the silt into the sand. The third sand core was collected in the center of the area between U47, U48, U49 and U50 (within three feet of all of these piles). This sand core was found to contain 50.5 inches of sand with and approximate 5-inch zone of light migration of silt into the sand.

Based on these observations, I feel the pile driving at cluster C-2\3 has not significantly affected the integrity of the sand blanket. The migration of silt into the sand blanket was minimal ranging between 2 and 6 inches. The tolerance specified in the Environmental Monitoring and Response Plan (two thirds of the thickness of the sand blanket) at these locations ranges between 30 and 34 inches.

cc: Dennis Suler
Ellis Don
Carl Wang
Twiggs Randal

S&ME, Inc. 840 Low Country Boulevard, Mt. Pleasant, South Carolina 29464, (803) 884-0005, Fax (803) 881-6149

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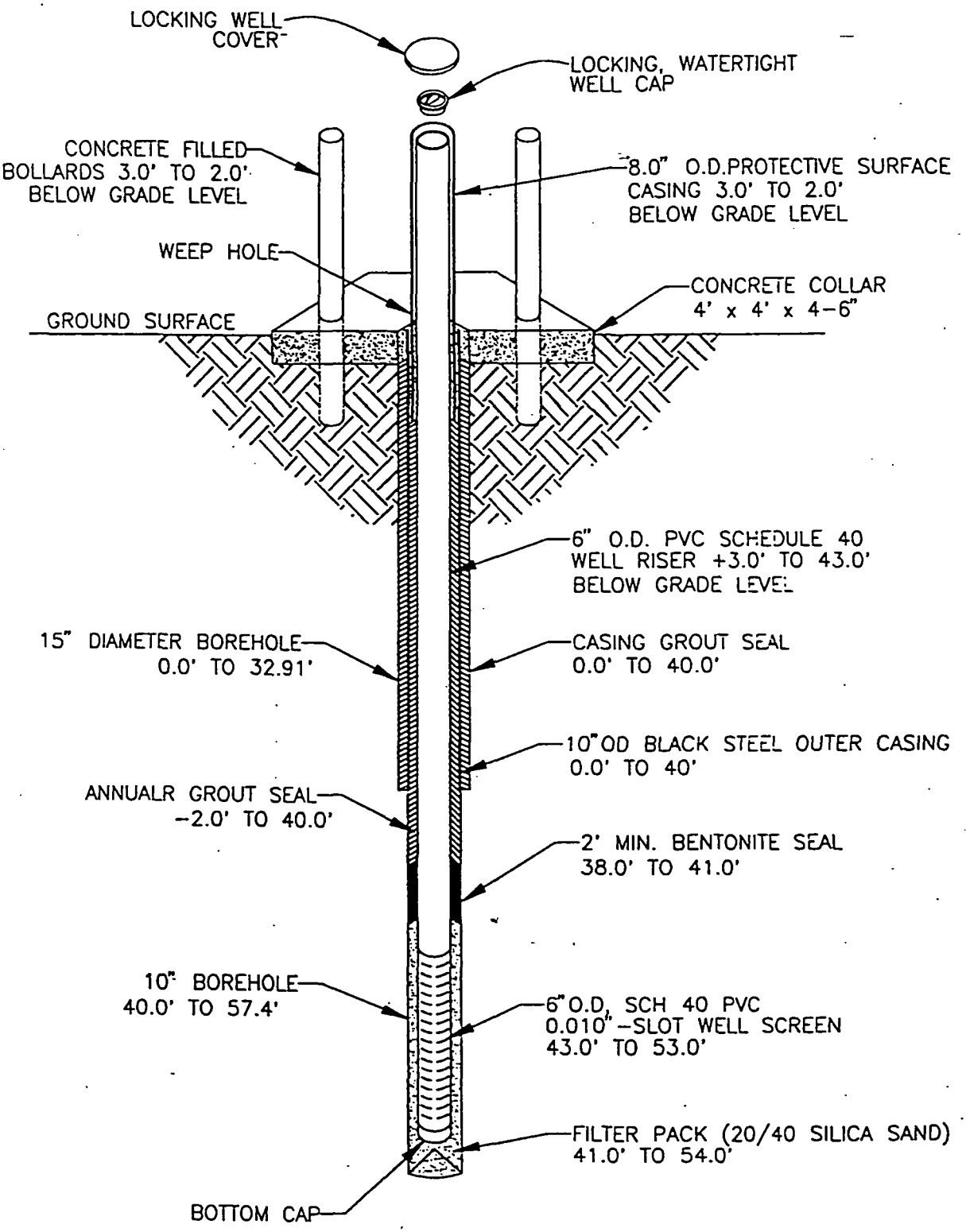
APPENDIX D

MW-AQ2 AS-BUILT AND WELL LOG

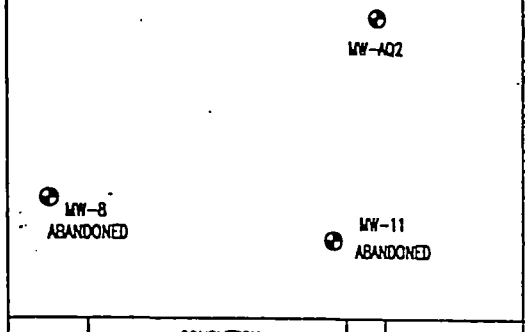
MW-AQ2



MEI MARION ENVIRONMENTAL INC.	DOUBLE CASED MONITORING WELL CONSTRUCTION AS-BUILT PROPOSED CHARLESTON AQUARIUM CHARLESTON, SC.	PROJECT NO.: 95-579	FACILITY NO.:
		DATE: 3-7-96	DRAWN BY: B.W.G.
		CONSTRUCTED BY:	FIGURE NO.:

PROPOSED SOUTH CAROLINA AQUARIUM SITE, CHARLESTON, S.C.	N/A	95579	MW-AQ2	95-579\MW-AQ2	B.W.G.	of 2

LOCATION MAP:



START DATE & TIME: 1-23-96 10:00 AM

COMP. DATE & TIME: 2-7-96 12:00 NOON

DRILLER: MIKE STURDEVANT/GEOTEK DRILLING CO., INC. LICENSE No. 794

DRILLING METHOD: 4.25" ID. CONTINUOUS FLIGHT HOLLOW STEM AUGER, 10" MUD ROTARY AND 11" MUD ROTARY.

ELEV (MSL): +9.86' T.D.: 57.4' (50.91'MSL)

WATER ENCOUNTERED: 5.0' (▽) WATER LEVEL: 9.01'(▼)

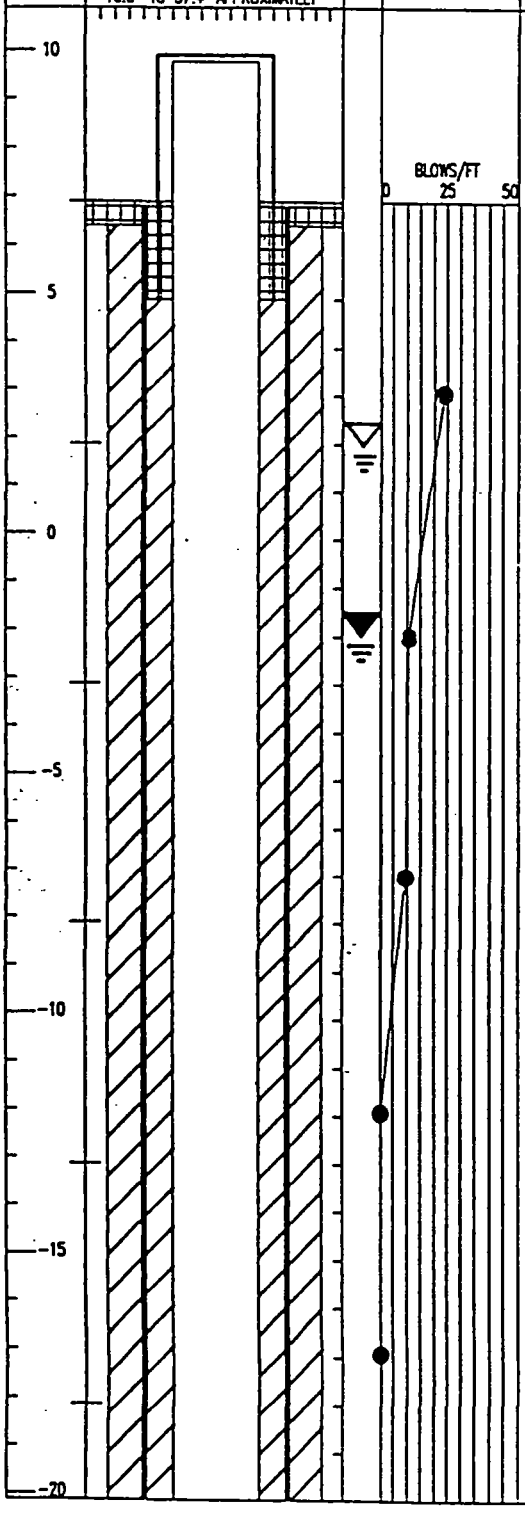
LOGGED BY: E. PAINE GILY SC/UCF: 2007

SIGNATURE: E. Paine Gily DATE: 8/6/96

MARION ENVIRONMENTAL INC.

Standard Boring Log

LATITUDE: N32°47'28"
LONGITUDE: W79°55'32.5"



DEPTH	GRAPHIC LITHOLOGY	PID (PPM)	SAMPLES & CORES TYPE	I/R	ANAL	DESCRIPTION (Color, Textures, Structure, etc.)
0						ADVANCED AUGERS TO 3.0' BELOW GRADE LEVEL. CUTTINGS REVEALED FILL: YELLOWISH-BROWN 10 YR 5/4 SAND, FINE TO MEDIUM, SUBROUNDED, MOIST.
		BDL	SS	X	OVD	FILL: YELLOWISH-BROWN 10 YR 5/4 SAND, FINE TO MEDIUM, SUBROUNDED TO ROUNDED, TRACE SILT, MOIST.
5						AUGERED TO 8.0'. CUTTINGS REVEALED FILL: BLACK 10 YR 2/1 TO VERY DARK BROWN SAND, FINE TO MEDIUM, SUBROUNDED, MOIST.
	H	15	SS	X	OVD	FILL: BLACK 10 YR 2/1, SAND, FINE TO COURSE, WOOD, BRICK, ODOR, VOID ENCOUNTERED AT APPROXIMATELY 11.0' BELOW GRADE LEVEL (11.0' TO 12.0').
10	H					ADVANCED TO 13.0' BELOW GRADE LEVEL. FILL: BLACK 10 YR 2/1, SAND, FINE TO COURSE, WOOD, BRICK, ODOR, VOID ENCOUNTERED AT APPROXIMATELY 11.0' BELOW GRADE LEVEL (11.0' TO 12.0').
		BDL	SS	X	OVD	FILL TO 14 BLACK (N) SILT, LITTLE FINE SAND, WET, ODOR, STAINED. FILL TO 14' BELOW GRADE LEVEL.
15						AUGERED TO 18' BELOW GRADE LEVEL. DEBRIS: WOOD ENCOUNTERED AT APPROXIMATELY 17' BELOW GRADE LEVEL.
		-	-	-	-	NO RECOVERY.
20						ADVANCED AUGERS TO 23.0'. DEBRIS: WOOD AT APPROXIMATELY 22.0' BELOW GRADE LEVEL.
	H	40	SS	>	OVD	BLACK (N) SILT, LITTLE FINE SAND, WET, ODOR/SHEEN.
25						AUGERED TO 28.0'. DEBRIS ENCOUNTERED: WOOD

PROPOSED SOUTH CAROLINA AQUARIUM SITE, CHARLESTON, S.C.	N/A	95579	MW-AQ-2	95-579\MW-AQ-2	B.W.G.	of 2

COMMENTS: WATER ENCOUNTERED: 5.0' (▽); WATER LEVEL: 9.01' (▼)

MSL	COMPLETION DIAGRAM	WATER LEVEL	PENETRATION RATE	DEPTH	GRAPHIC LITHOLOGY	OVD (PPM)	SAMPLES & CORES TYPE	SAMPLES & CORES I/R	SAMPLES & CORES ANAL	DESCRIPTION (Color, Textures, Structure, etc.)
	BOREHOLE DIAMETER: 15.0' TO 33.91' 10.0' TO 50.91' APPROXIMATELY		0 25 50							
						-	-	-	-	ATTEMPTED TO PRESS SPOON, NO RECOVERY.
-25				30		100	SS		OVD	VERY DARK GRAY 5 YR 3/1 SILTY SAND, FINE SAND, WET, ODOR.
						90	SS		OVD	VERY DARK GRAY (5 YR 3/1) SILTY SAND, FINE TO MEDIUM, WET, ODOR. DEBRIS AT 33.90'.
				35		85	SS		OVD	VERY DARK GRAY (5 YR 3/1) SILTY SAND, FINE TO MEDIUM, WET, ODOR.
-30										VERY DARK GRAY (5 YR 3/1) SILTY SAND, FINE TO MEDIUM, WET, ODOR.
				40		75				
-35										DEBRIS AT 41.4'.
										VERY DARK GRAY (5 YR 3/1) SILTY SAND, FINE TO MEDIUM, WET, ODOR.
				45		75				
-40										DEBRIS AT 45.90'
										DEBRIS AT 47.1'
				50						
-45										
				55						
-50										
				60						TOTAL DEPTH APPROXIMATELY 57.4' BELOW GRADE LEVEL.
-55										

APPENDIX E

GROUNDWATER BASELINE DATA

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
FEBRUARY 20, 1996 SAMPLING EVENT

PARAMETER	CRITERIA (ug/l)	MWAQ-1		MWAQ-2		MWAQ-3		MWAQ-13		MWAQ-RB	
		RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)
Antimony	6	U	5.6	U	5.6	U	5.6	U	5.6	U	5.6
Arsenic	50	U	50	U	50	U	50	U	50	U	50
Chromium	100	U	100	U	100	U	100	U	100	U	100
Copper	1,300	U	1300	U	1300	U	1300	U	1300	U	1300
Lead	15	U	14.4	U	14.4	U	14.4	U	14.4	U	14.4
Manganese	180	U	180	U	180	U	180	U	180	U	180
Zinc	5,000	U	5000	U	5000	U	5000	U	5000	U	5000
PCBs											
PCB 1016	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1221	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1232	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1242	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1248	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1254	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1260	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
Benzene	5	U	5	25	5	7	5	7	5	U	5
Naphthalene	-	U	2	670 (D)	11	250 (D)	4	290 (D)	4	U	2
Benzo(a)Anthracene	2	U	2	17 (D)	11	5 (D)	4	U	4	U	2
Benzo(b)Fluoranthene	2	U	2	U	11	U	4	U	4	U	2
Benzo(a)Pyrene	0.2	U	2	U	11	U	4	U	4	U	2
Benzo(k)Fluoranthene	2	U	2	U	11	U	4	U	4	U	2
Chrysene	20	U	2	U	11	U	4	U	4	U	2
Dibenz(a,h)Anthracene	0.2	U	2	U	11	U	4	U	4	U	2
Indeno(1,2,3-cd)Pyrene	2.	U	2	U	11	U	4	U	4	U	2
Mineral Spirits	NONE	U	100	1370	100	1097	100	1057	100	U	100

NOTES: (1) MWAQ-13 is a duplicate of MWAQ-3.

CLP FLAGS

ORGANICS

B	Found in blank
J	Esitmated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.
D	Sample diluted.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
FEBRUARY 21, 1996 SAMPLING EVENT

PARAMETER	CRITERIA (ug/l)	MWAQ-1		MWAQ-2		MWAQ-3		MWAQ-12		MWAQ-RB	
		RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)
Antimony	6	U	5.6	U	5.6	U	5.6	U	5.6	U	5.6
Arsenic	50	U	50	U	50	U	50	U	50	U	50
Chromium	100	U	100	U	100	U	100	U	100	U	100
Copper	1,300	U	1300	U	1300	U	1300	U	1300	U	1300
Lead	15	U	14.4	U	14.4	U	14.4	U	14.4	U	14.4
Manganese	180	U	180	U	180	U	180	U	180	U	180
Zinc	5,000	U	5000	U	5000	U	5000	U	5000	U	5000
PCBs											
PCB 1016	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1221	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1232	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1242	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1248	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1254	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1260	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
Benzene	5	U	5	28	5	8	5	27	5	U	5
Naphthalene	-	U	2	460 (D)	11	340 (D)	11	430 (D)	11	U	2
Benzo(a)Anthracene	2	U	2	U	11	U	11	U	11	U	2
Benzo(b)Fluoranthene	2	U	2	U	11	U	11	U	11	U	2
Benzo(a)Pyrene	0.2	U	2	U	11	U	11	U	11	U	2
Benzo(k)Fluoranthene	2	U	2	U	11	U	11	U	11	U	2
Chrysene	20	U	2	U	11	U	11	U	11	U	2
Dibenz(a,h)Anthracene	0.2	U	2	U	11	U	11	U	11	U	2
Indeno(1,2,3-cd)Pyrene	2	U	2	U	11	U	11	U	11	U	2
Mineral Spirits	NONE	U	100	1200	100	1010	100	1350	100	U	100

NOTES: (1) MWAQ-12 is a duplicate of MWAQ-2.

CLP FLAGS

ORGANICS

B	Found in blank
J	Esitmated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.
D	Sample diluted.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
FEBRUARY 26, 1996 SAMPLING EVENT

PARAMETER	CRITERIA (ug/l)	MWAQ-1		MWAQ-2		MWAQ-3		MWAQ-11		MWAQ-RB	
		RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)
Antimony	6	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4
Arsenic	50	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4
Chromium	100	12.6	1.1	12.6	1.1	13.1	1.1	12.2	1.1	U	1.1
Copper	1,300	U	1.1	U	1.1	U	1.1	U	1.1	U	1.1
Lead	15	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2
Manganese	180	96.3	1.1	81.6	1.1	49.1	1.1	97.0	1.1	U	1.1
Zinc	5,000	145	1.1	35.2	1.1	84.8	1.1	61.2	1.1	1.6	1.1
PCBs											
PCB 1016	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1221	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1232	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1242	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1248	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1254	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
PCB 1260	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5
Benzene	5	U	5	22	5	6	5	U	5	U	5
Naphthalene	NONE	U	2	460 (D)	10	160 (D)	4	U	2	U	2
Acenaphthylene	NONE	U	2	U	10	U	4	U	2	U	2
Acenaphthene	NONE	U	2	140 (D)	10	45 (D)	4	U	2	U	2
Fluorene	NONE	U	2	90 (D)	10	24 (D)	4	U	2	U	2
Phenanthrene	NONE	U	2	170 (D)	10	41 (D)	4	U	2	U	2
Anthracene	NONE	U	2	17 (D)	10	5 (D)	4	U	2	U	2
Fluoranthene	NONE	U	2	61 (D)	10	13 (D)	4	U	2	U	2
Pyrene	NONE	U	2	41 (D)	10	9 (D)	4	U	2	U	2
Benzo(a)Anthracene	2	U	2	11 (D)	10	U	4	U	2	U	2
Chrysene	NONE	U	2	U	10	U	4	U	2	U	2
Benzo(b)Fluoranthene	2	U	2	U	10	U	4	U	2	U	2
Benzo(k)Fluoranthene	NONE	U	2	U	10	U	4	U	2	U	2
Benzo(a)Pyrene	0.2	U	2	U	10	U	4	U	2	U	2
Indeno(1,2,3-cd)Pyrene	NONE	U	2	U	10	U	4	U	2	U	2
Dibenz(a,h)Anthracene	0.2	U	2	U	10	U	4	U	2	U	2
Benzo(g,h,i)perylene	NONE	U	2	U	10	U	4	U	2	U	2
Mineral Spirits	NONE	U	100	1060	100	660	100	U	100	U	100

NOTES: (1) MWAQ-11 is a duplicate of MWAQ-1.

CLP FLAGS

ORGANICS

B	Found in blank
J	Esitmated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.
D	Sample diluted.

METALS

B	Below contract required detection limit but above instrument detection limit.
U	Not detected.
N	Spike sample recovery was outside control limits.

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
FEBRUARY 27, 1996 SAMPLING EVENT

PARAMETER	CRITERIA (ug/l)	MWAQ-1		MWAQ-2		MWAQ-3		MWAQ-4		MWAQ-RB	
		RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)
Chloromethane	NONE	U	5	U	5	U	5	U	5	U	5
Vinyl Chloride	NONE	U	5	U	5	U	5	U	5	U	5
Bromomethane	NONE	U	5	U	5	U	5	U	5	U	5
Chloroethane	NONE	U	5	U	5	U	5	U	5	U	5
Acetone	NONE	270 (D)	10	U	5	U	5	U	5	U	5
1,1-Dichloroethene	NONE	U	5	U	5	U	5	U	5	U	5
Methylene Chloride	NONE	U	5	U	5	U	5	U	5	U	5
Carbon Disulfide	NONE	U	5	U	5	U	5	U	5	U	5
trans-1,2-Dichloroethene	NONE	U	5	U	5	U	5	U	5	U	5
1,1-Dichloroethane	NONE	U	5	U	5	U	5	U	5	U	5
2-Butanone	NONE	U	5	U	5	U	5	U	5	U	5
cis-1,2-Dichloroethene	NONE	U	5	U	5	U	5	U	5	U	5
Chloroform	NONE	U	5	0 (J)	5	U	5	U	5	U	5
1,2-Dichloroethane	NONE	U	5	U	5	U	5	U	5	U	5
1,1,1-Trichloroethane	NONE	U	5	U	5	U	5	U	5	U	5
Carbon Tetrachloride	NONE	U	5	U	5	U	5	U	5	U	5
Benzene	5	U	5	22	5	6	5	6	5	U	5
1,2-Dichloropropane	NONE	U	5	U	5	U	5	U	5	U	5
Trichloroethene	NONE	U	5	U	5	U	5	U	5	U	5
Bromodichloromethane	NONE	U	5	U	5	U	5	U	5	U	5
cis-1,3-Dichloropropene	NONE	U	5	U	5	U	5	U	5	U	5
4-Methyl-2-Pentanone	NONE	U	5	U	5	U	5	U	5	U	5
trans-1,3-Dichloropropene	NONE	U	5	U	5	U	5	U	5	U	5
1,1,2-Trichloroethane	NONE	U	5	U	5	U	5	U	5	U	5
Toluene	NONE	U	5	2 (J)	5	3 (J)	5	3 (J)	5	U	5
2-Hexanone	NONE	U	5	U	5	U	5	U	5	U	5
Dibromochloromethane	NONE	U	5	U	5	U	5	U	5	U	5
Tetrachloroethene	NONE	U	5	U	5	U	5	U	5	U	5
Chlorobenzene	NONE	U	5	U	5	U	5	U	5	U	5
Ethylbenzene	NONE	2 (J)	5	7	5	5	5	5	5	U	5
m,p-Xylene	NONE	2 (J)	5	14	5	6	5	7	5	U	5
Bromoform	NONE	U	5	U	5	U	5	U	5	U	5
Styrene	NONE	U	5	U	5	U	5	U	5	U	5
o-Xylene	NONE	4 (J)	5	12	5	5	5	6	5	U	5
1,1,2,2-Tetrachloroethane	NONE	U	5	U	5	U	5	U	5	U	5

NOTES: (1) MWAQ-4 is a duplicate of MWAQ-3.

CLP FLAGS

ORGANICS

- B Found in blank
- J Estimated value, below quantitation limit.
- U Not detected.
- BJ Found in blank and below quantitation limit.
- D Sample diluted.

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
FIRST FEBRUARY 28, 1996 SAMPLING EVENT

PARAMETER	CRITERIA (ug/l)	MWAQ-1A		MWAQ-2A		MWAQ-3A		MWAQ-4A		MWAQ-RBA	
		RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)
Chloromethane	NONE	U	10	U	5	U	5	U	5	U	5
Vinyl Chloride	NONE	U	10	U	5	U	5	U	5	U	5
Bromomethane	NONE	U	10	U	5	U	5	U	5	U	5
Chloroethane	NONE	U	10	U	5	U	5	U	5	U	5
Acetone	NONE	240 (D)	10	U	5	U	5	U	5	U	5
1,1-Dichloroethene	NONE	U	10	U	5	U	5	U	5	U	5
Methylene Chloride	NONE	U	10	U	5	U	5	U	5	U	5
Carbon Disulfide	NONE	U	10	U	5	U	5	U	5	U	5
trans-1,2-Dichloroethene	NONE	U	10	U	5	U	5	U	5	U	5
1,1-Dichloroethane	NONE	U	10	U	5	U	5	U	5	U	5
2-Butanone	NONE	U	10	U	5	U	5	U	5	U	5
cis-1,2-Dichloroethene	NONE	U	10	U	5	U	5	U	5	U	5
Chloroform	NONE	U	10	U	5	U	5	U	5	U	5
1,2-Dichloroethane	NONE	U	10	U	5	U	5	U	5	U	5
1,1,1-Trichloroethane	NONE	U	10	U	5	U	5	U	5	U	5
Carbon Tetrachloride	NONE	U	10	U	5	U	5	U	5	U	5
Benzene	5	U	10	22	5	5	5	22	5	U	5
1,2-Dichloropropane	NONE	U	10	U	5	U	5	U	5	U	5
Trichloroethene	NONE	U	10	U	5	U	5	U	5	U	5
Bromodichloromethane	NONE	U	10	U	5	U	5	U	5	U	5
cis-1,3-Dichloropropene	NONE	U	10	U	5	U	5	U	5	U	5
4-Methyl-2-Pentanone	NONE	U	10	U	5	U	5	U	5	U	5
trans-1,3-Dichloropropene	NONE	U	10	U	5	U	5	U	5	U	5
1,1,2-Trichloroethane	NONE	U	10	U	5	U	5	U	5	U	5
Toluene	NONE	U	10	2 (J)	5	2 (J)	5	2 (J)	5	U	5
2-Hexanone	NONE	U	10	U	5	U	5	U	5	U	5
Dibromochloromethane	NONE	U	10	U	5	U	5	U	5	U	5
Tetrachloroethene	NONE	U	10	U	5	U	5	U	5	U	5
Chlorobenzene	NONE	U	10	U	5	U	5	U	5	U	5
Ethylbenzene	NONE	3 (J)	5	7	5	5	5	7	5	U	5
m,p-Xylene	NONE	2 (J)	5	15	5	8	5	14	5	U	5
Bromoform	NONE	U	10	U	5	U	5	U	5	U	5
Styrene	NONE	U	10	U	5	U	5	U	5	U	5
o-Xylene	NONE	5	5	13	5	6	5	12	5	U	5
1,1,2,2-Tetrachloroethane	NONE	U	10	U	5	U	5	U	5	U	5

NOTES: (1) MWAQ-4 is a duplicate of MWAQ-2.

CLP FLAGS

ORGANICS

B	Found in blank
J	Estimated value, below quantitation limit.
U	Not detected.
BJ	Found in blank and below quantitation limit.
D	Sample diluted.

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
SECOND FEBRUARY 28, 1996 SAMPLING EVENT

PARAMETER	CRITERIA (ug/l)	MWAQ-1B		MWAQ-2B		MWAQ-3B		MWAQ-4B		MWAQ-RBB	
		RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)	RESULT (ug/l)	DL (ug/l)
Chloromethane	NONE	U	5	U	5	U	5	U	5	U	5
Vinyl Chloride	NONE	U	5	U	5	U	5	U	5	U	5
Bromomethane	NONE	U	5	U	5	U	5	U	5	U	5
Chloroethane	NONE	U	5	U	5	U	5	U	5	U	5
Acetone	NONE	210 (D)	10	U	5	U	5	290	5	U	5
1,1-Dichloroethene	NONE	U	5	U	5	U	5	U	5	U	5
Methylene Chloride	NONE	U	5	U	5	U	5	U	5	U	5
Carbon Disulfide	NONE	U	5	U	5	U	5	U	5	U	5
trans-1,2-Dichloroethene	NONE	U	5	U	5	U	5	U	5	U	5
1,1-Dichloroethane	NONE	U	5	U	5	U	5	U	5	U	5
2-Butanone	NONE	U	5	U	5	U	5	U	5	U	5
cis-1,2-Dichloroethene	NONE	U	5	U	5	U	5	U	5	U	5
Chloroform	NONE	U	5	U	5	U	5	U	5	5	5
1,2-Dichloroethane	NONE	U	5	U	5	U	5	U	5	U	5
1,1,1-Trichloroethane	NONE	U	5	U	5	U	5	U	5	U	5
Carbon Tetrachloride	NONE	U	5	U	5	U	5	U	5	U	5
Benzene	5	U	5	22	5	6	5	U	5	U	5
1,2-Dichloropropane	NONE	U	5	U	5	U	5	U	5	U	5
Trichloroethene	NONE	U	5	U	5	U	5	U	5	U	5
Bromodichloromethane	NONE	U	5	U	5	U	5	U	5	U	5
cis-1,3-Dichloropropene	NONE	U	5	U	5	U	5	U	5	U	5
4-Methyl-2-Pentanone	NONE	U	5	U	5	U	5	U	5	U	5
trans-1,3-Dichloropropene	NONE	U	5	U	5	U	5	U	5	U	5
1,1,2-Trichloroethane	NONE	U	5	U	5	U	5	U	5	U	5
Toluene	NONE	U	5	2 (J)	5	2 (J)	5	U	5	U	5
2-Hexanone	NONE	U	5	U	5	U	5	U	5	U	5
Dibromochloromethane	NONE	U	5	U	5	U	5	U	5	U	5
Tetrachloroethene	NONE	U	5	U	5	U	5	U	5	U	5
Chlorobenzene	NONE	U	5	U	5	U	5	U	5	U	5
Ethylbenzene	NONE	3 (J)	5	7	5	5	5	3 (J)	5	U	5
m,p-Xylene	NONE	2 (J)	5	15	5	8	5	2 (J)	5	U	5
Bromoform	NONE	U	5	U	5	U	5	U	5	U	5
Styrene	NONE	U	5	U	5	U	5	U	5	U	5
o-Xylene	NONE	5 (J)	5	13	5	6	5	4 (J)	5	U	5
1,1,2,2-Tetrachloroethane	NONE	U	5	U	5	U	5	U	5	U	5

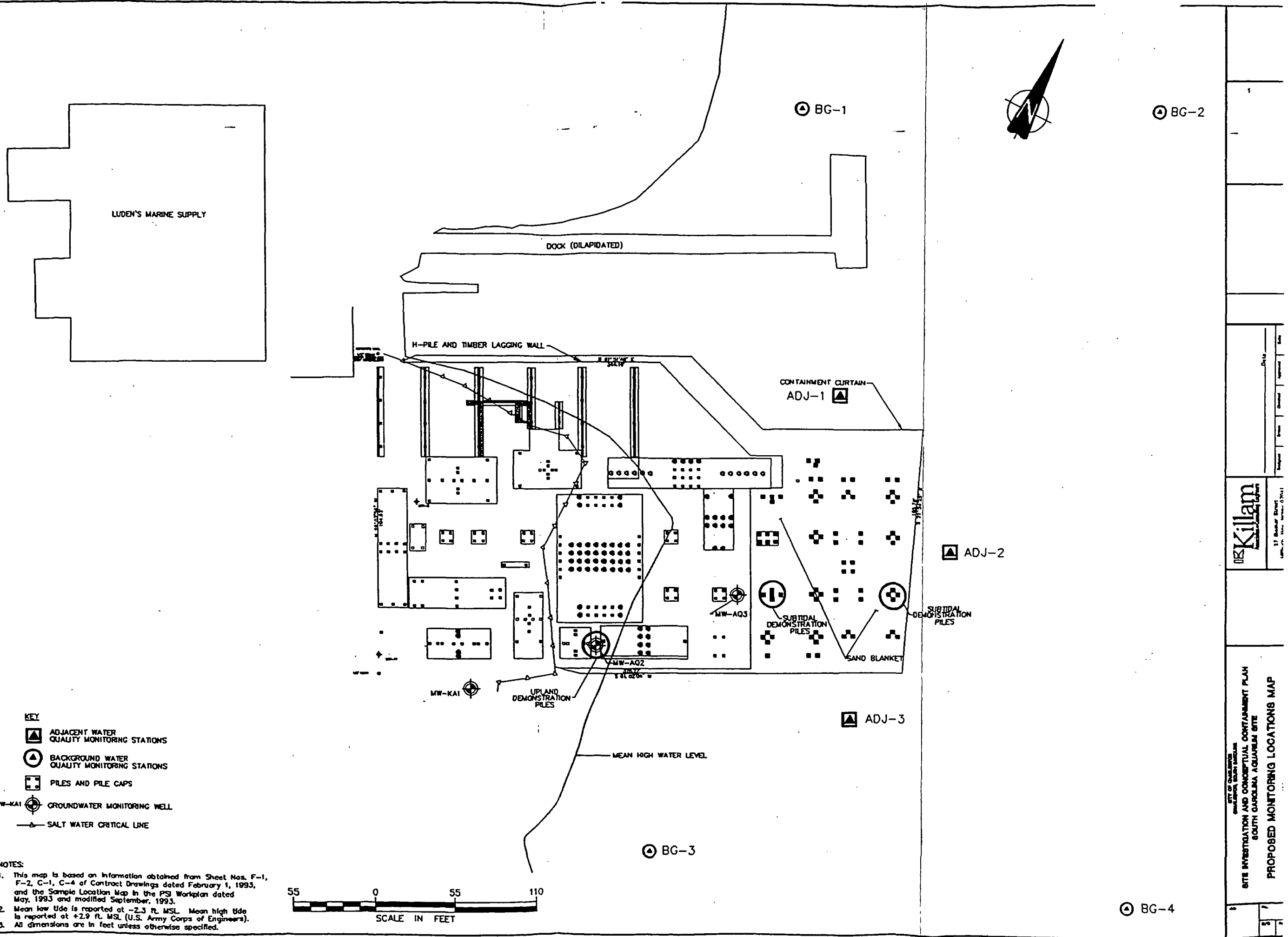
NOTES: (1) MWAQ-4 is a duplicate of MWAQ-1.

CLP FLAGS

ORGANICS

- B — Found in blank
- J — Estimated value, below quantitation limit.
- U — Not detected.
- BJ — Found in blank and below quantitation limit.
- D — Sample diluted.

FIGURE



NOTES:

1. This map is based on information obtained from Sheet Nos. F-1, F-2, C-1, C-4 of Contract Drawings dated February 1, 1993, and the Sample Location Map in the PSI Workplan dated May, 1993 and modified September, 1993.
2. Mean low tide is reported at -2.3 ft. MSL. Mean high tide is reported at +2.9 ft. MSL (U.S. Army Corps of Engineers).
3. All dimensions are in feet unless otherwise specified.

CITY OF CHARLESTON
CHARLESTON, SOUTH CAROLINA

SITE INVESTIGATION AND CONCEPTUAL CONTAINMENT PLAN
SOUTH CAROLINA AQUARIUM SITE

PROPOSED MONITORING LOCATIONS MAP

Killam Associates

Contract No.